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[OFFICIAL NOTICE.]

Annual Meeting, Illinois Gas Association.

ILLINOIS GAS ASSOCIATION, OFFICE OF THE SECRETARY, ELGIN, ILLS., Feb. 6, 1911.

To the Members, Illinois Gas Association: The annual meeting of the Illinois Gas Association will be held in the Auditorium Hotel, Chicago, Ills., March 15th and 16th, 1911. The banquet will be held the evening of March 15th.

As soon as the papers, etc., have been decided upon, the information will be forwarded. Yours truly, C. B. STROHN, Secretary.

[OFFICIAL NOTICE.]

Seventh Meeting, Southwestern Electrical and Gas Association.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION, 1316 COMMERCE ST., DALLAS, TEX., Jan. 29, 1911.

To the Members, Southwestern Electrical and Gas Association: At a called meeting of the Advisory and Executive Committees of the Soutwestern Electrical and Gas Association, it was decided to hold the Seventh Annual Convention of the Association in Houston, Tex., April 27, 28 and 29, 1911. D. G. FISHER, Secretary.

BRIEFLY TOLD.

FEBRUARY MEETING, PHILADELPHIA SECTION, ILLUMINATING ENGINEERING SOCIETY.—The regular meeting of the Philadelphia Section of Illuminating Engineering Society was held the evening of the 17th inst. The usual dinner preceding the meeting was served in Green's Hotel at 6:30 P.M. After the dinner, which was participated in by 23 members and guests, including the speaker of the evening, the party adjourned to the auditorium of the Philadelphia Electric Company, 10th and Chestnut streets. The meeting was called to order by the Chairman, Mr. Wm. J. Serrill. The reading of the minutes by the Secretary, Mr. George B. Muth, who was present, was dispensed with. Forty-three members and 22 visitors were present to hear the paper of the evening, "Artificial Light *versus* Sun Light for the Making of Moving Picture Films," which was read by the author, Mr. Edward L. Simons. Mr. Simons stated that, while daylight is the best illuminant for the taking of photographs, it could not be relied upon to the extent that pictures may be taken every day. In January, for instance, there were 20 out of 27 days on which daylight could not be utilized. Even in August there were many days which were too cloudy to admit of taking good photographs. For this reason artificial light had been resorted to. The spectrum obtained from the mercury vapor tube, which is the best artificial illuminant for the taking of pictures, was shown to closely approximate the solar spectrum. The spectrum of the electric arc, which was also shown, was not rich enough in the violet rays. While the mercury vapor tube has the actinic properties necessary for making good photographs, when used alone it causes the colors to appear ghastly, hence it is not conducive to good acting. For this reason the combination of the mercury vapor tube and the electric arc is found best for the making of the moving picture films. In Mr. Simons' studio an intensity of 500-foot candles is obtained on the object to be photographed, which intensity is found necessary in order to give the camera the correct sized shutter opening for the taking of 16 pictures per second. Two films were shown on the moving picture machine, the first having been taken under the electric arc alone, the second under a combination of Cooper-Hewitt tubes and arc lamps. The superiority of the latter film was very marked. The discussion which followed was participated in by Messrs. Serrill, Gilpin, Bond, Macbeth, Morton, Green and Muth. Practically all the questions which were asked were answered by Mr. Holz, Mr. Simons' associate. The questions and answers were as follows: What is the cause of the lines in the pictures, which are very [illegible]

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"These are only seen on old films, and are due to having been run through a dirty machine, the particles of dust scratching the film." "On a bright, sunlight day, is not more than 500-foot candles obtainable on the horizontal plane?" "Yes; but the actinic projections of bright sunlight may not be as good as on a slightly cloudy day." "Has the horizontal movement of the film, which might create a more pleasant sensation, been tried?" "While the stereopticon views have both vertical and horizontal movement, nothing of this sort has ever been tried with the moving picture machine, on account of mechanical difficulties." Mr. Holz stated that many pictures taken outdoors were touched up.

THE ELLIOTT SERIES OF LECTURES.—Dr. Arthur H. Elliott, Consulting Engineer-Chemist, Consolidated Gas Company, New York, has given a very interesting series of lectures before the Classes of "Mines, Engineering and Chemistry," Columbia University. These lectures, which were given at the conclusion of the instruction on the chemistry of gas manufacture, were particularly designed to show the problems involved in gas making and distribution on a large scale, with especial reference to recent improvements in the art. Under the caption "Recent Improvements in Gas Manufacture." Dr. Elliott, on February 8th, discussed the great mechanical and engineering problems involved in the manufacture and supply of gas for New York city, and showed the amount of raw material, finished products, and by-products handled in order to produce the 140,000,000 cubic feet of gas required to supply the daily consumption of Greater New York. The lecture was fully illustrated by diagram and lantern slides, showing apparatus, operation and appliances. In many instances illustrated comparisons were made between old and new practice, and the students were given a clear and comprehensive conception of the great mechanical and engineering problems developed in the construction of the Astoria works. This lecture on "Gas Purification," delivered the 10th inst., was devoted to a detailed consideration of the chemistry and apparatus involved in scrubbing and purifying gas, particular attention being given to the methods in vogue for recovering ammonia, tar, etc. The lecture was fully illustrated by lantern slides and pictures of existing installations. On the 13th inst. the subject of the lecture was "Recent Developments in Gas Purification," which discourse explained in detail the recent improvements in the methods used for the purification of gas. Dr. Elliott, in his capacity as Consulting Engineer-Chemist for the Consolidated Gas Company, has been closely associated with the development of the method of extracting and recovering cyanogen. The results of the new processes as applied to city gas supply were illustrated by a large number of samples, analyses, etc. On the 15th inst. the Doctor lectured on the "Use and Abuse of Gas." In this instance the adaptability of gas for light, heat and power purposes was discussed, and numerous illustrations of unique applications were shown. Illustrations of the adaptability of gas to almost every phase of domestic and industrial use were clearly shown by a large number of lantern slides. On the 17th inst. Doctor Elliott's remarks concerned "The Valuation of Gas." This was a highly instructive lecture on the scientific and practical problems involved in determining the value of gas. It was discussed from the standpoints of the open tip burner and the incandescent gas burner in illumination, and the calorific value of heating and power. The underlying principles of photometric determinations were fully discussed and illustrated, by apparatus as well as the principles and practices obtaining in determinations by the calorimeter. The course of lectures is a part of the general plan of teaching "Industrial Chemistry" by lectures from prominent men connected with the great industries concerned. Dr. Elliott's connection with the Consolidated Gas Company, in the capacity of Consulting Engineer-Chemist, in the development and erection of one of the largest gas works in the world, makes it particularly fitting that he should present to the engineering students the results of his extended experience and intimate knowledge of this important chemical industry.—W.

THE ADVANTAGE OF LARGE OVER SMALL LIGHTING UNITS.—The development of tungsten lamps should be a matter of interest to the gas industry, for in spite of its many inherent defects and its almost prohibitive price, the publicity given thereto has created a notable demand. In the transition, from the 16-candle power carbon or gem lamps to the newer types, the central stations have not succeeded in getting a lamp of equal wattage instead of a lamp of the like candle power to replace the old types, with the result that the 20-candle power tungsten is rapidly becoming the standard size for home lighting. Within the past 2 years there has been an effort to introduce small sized gas lamps of both upright and inverted types, which is unlikely to become a feature of the greatest ultimate benefit to the industry, for the mechanic stability decreases with the decrease in the size of the unit, which feature alone demands that each burner should consume from 3 cubic feet upwards. Fortunately the same conditions hold good from a lighting standpoint, since it is far better to give more light for equal money than a like quantity of light at a decreased expense. Although it seems needless to state that the object of lighting is to enable us to see without eyestrain and discomfort, which means instead of trying to obtain the greatest number of foot candles by the aid of reflection we might better diffuse and soften it. The installation of the necessary lamps arranged with diffusing globes to produce the required intensity of illumination would yield the maximum comfort for the consumer and the maximum goodwill and revenue to the gas companies. A return to small units would be a step backward.

STREET LIGHTING.—The principal thoroughfares of the cities, both large and small, in this country are lighted by means of electricity, and for reasons which do not include the question of merit. Nearly 100 cities can now boast of some special street lighting installation, glaring and otherwise, the majority of which could be improved were gas the illuminant. During the past year these installations were made in probably 30 cities, and as many more will undoubtedly follow in 1911. The keynote of the success of gas, both indoors and out, is maintenance; and now, that large and effective organizations are available for this work, a goodly portion of the street lighting improvements should, and undoubtedly will, be done by means of gas.

CURRENT MENTION—

WITH exceeding satisfaction we note that Mr. Carlton Macy, President of the Queens Borough (N. Y.) Gas and Electric Company, is rapidly recovering from the shock consequent upon an operation for appendicitis that he underwent some days ago in the Presbyterian Hospital. That he was plucky we all knew; but to that reputation he has added the evidence that fortitude is another of his attributes.

Publications.

"American Gas Institute Proceedings," 1910.—The annual publication of the "Proceedings" of the American Institute, 6 by 9; pp. 880; illustrated. Furnished to members. The book is published much in the same style as in former years, although it carries 80 pages less than did the book for 1909, the previous year. The papers and discussions from the annual meeting occupy 515 pages, or 100 more than 1909, and the wrinkles 50 more; but the earlier volume has some 150 pages of valuable technical data from committee reports, and perhaps 65 pages of matter in excess from the "Bureau of Information." The membership, numbering 1,348, remains practically the same.

Elevators.—Catalogue, 9 by 6; 74 pp.; illustrated. Craig, Ridgway & Son Co., Coatesville, Pa. A full line of steam, hydraulic and electric elevators and similar devices for freight and passenger service.

Bulletin of Abstracts, February 1, 1911.—Abstracts of articles pertaining to the gas and electric business appearing in the technical journals, society proceedings, etc. Published bi-monthly; American Gas Institute.

The Edison Monthly.—A handsome "house organ," published by The New York Edison Company. Many clever ideas are brought out which should interest those in the commercial field.

Bulletin, Bureau of Standards.—Bulletin dated November, 1910; 7 by 10; 600 pp. Covering progress of research investigations in the form of papers, including one on "Photometric Units and Nomenclature," by Dr. E. B. Rosa.

Another "Baby Grand."—Illustrated leaflet concerning Rathbone, Sard & Company's Acorn wares.

Recording Thermometers.—"Bulletin" No. 127, The Bristol Company's recording thermometer. Gives charts and full description of apparatus.

Rate Calculations and Analysis.—Two pamphlets published by the St. Louis (Mo.) Public Service Commission, covering rates charged in St. Louis for electricity.

Producer Gas Power Plant Development in Europe.—Bulletin No. 4, Bureau of Mines; 6 by 9, 28 pp.; illustrated.

This report covers a continuation of the work undertaken in 1910, and with a view to bring forward the possibilities of low-grade fuel. The following plants are described: Scheveningen, Holland; "Mond Gas," Dudley Port, England; John's "Ring" producer, near Gaarbrücken, Germany; Skabersjö, Sweden, and others.

Engineering Abstracts.—Engineering Abstracts Supplement of the Journal of the International Institute of Technical Bibliography, 6¼ by 9¼ inches, in German. These abstracts are published monthly in German, and the series for 1910 is now being distributed.

[Official Report—As Approved by Committee on Publication.—Continued from Page 360.]

THE FIFTH ANNUAL MEETING, AMERICAN GAS INSTITUTE.

Held in New York City, October 19th to 21st (Inclusive), 1910

Second Day—Afternoon Session.

The President introduced Mr. W. A. Castor, who read his paper on

THE ACCURACY OF CONSUMERS' METERS.

From that time in the early days of gas making when it was discovered the business could only be made profitable by selling the product through meters, the problem ever confronting the gas company and the meter maker has been to obtain a meter that would register correctly the volume of gas delivered to the consumer. This point has been obscured at times by a discussion of the relative merits of different types, or of questions of speed and capacity; but to the clear thinking manager the question of accuracy of registration commands his best consideration.

No gas company manufactures its own meters, but buys them from a meter maker, who is forced by competition to keep up the high standard of constructive detail now demanded by the larger gas companies, with the idea constantly in view of maintaining and increasing, if possible, the reliability or dependability of the meter as an accurate measuring device over long periods of service. The meter manufacturer, therefore, is very much alive to the situation and must realize that in the long run the best make of meter, and by this is meant particularly the ability of the meter to hold its correct proof in active service, will be the make demanded by the gas company which keeps careful watch over the meters through which consumers are supplied. Meter manufacturers as a whole exercise every possible precaution, and welcome every suggestion which in any way tends to insure the proof of meters remaining correct or within very small limits of error.

It cannot be denied, however, that the meter makers have done their part in furnishing meters to the gas companies that are honestly and scientifically made, and which, to a very remarkable degree, possess the essential property of accuracy under the trying conditions of use in actual service.

The accuracy of the consumers' meter may be said to depend upon its ability to show upon the meter index dial a correct registration of the volume of gas or air passing through the meter. Newbigging lays down, as the second of his golden rules for gas managers, "Keep up the efficiency of the meters." In practice this efficiency is determined by a comparison of the registration of the meter with the reading of a scale attached to a correctly calibrated volumetric measuring device, indicating the volume of gas or air passing from this measuring device through the meter. A similar reading of both indicators shows a meter efficiency of 100 per cent., all of the gas or air passing through the meter having been correctly indicated by the proving head pointer or test hand. If the indicated efficiency of the meter is more than 100 per cent. the meter is fast, more gas being registered by the index than has actually passed through the meter; while, on the other hand, if the quantity registered by the meter index is less than indicated by the scale on the measuring device, the meter is slow.

Gas meters are usually set in cellars, but often of necessity must be set under porches, out-of-doors, in damp locations, or in places subject to sudden temperature changes; in fact, in almost every conceivable place and under almost every conceivable condition of variation in temperature and moisture. Moreover, when once set the meter generally remains for a term of years unattended, except for the periodical visit of the meter reader. Almost any other known piece of mechanism in use receives more attention and care than does a gas meter; boilers are washed out, shafting lubricated and pumps and engines overhauled at frequent intervals. The gas meter, however, receives almost no attention ordinarily, unless something develops necessitating a visit of the complaint man or fitter to the consumer's premises. The meter must be ready for business day-in and day-out, year-in and year-out, and consequently must be constructed in all its parts so as to possess a high degree of dependability; for dependability and accuracy of registration in meters go hand in hand.

Meters, like other mechanical devices, require attention and overhauling after certain periods of service. These periods of service should be determined by some definite means, and not guessed at; otherwise the gas company will be put to unnecessary expense in changing the meter before necessity demands, or on the other hand suffer losses due to the increased *slow net error* of registration of meters allowed to remain in service for too long a period of time.

As volumes of gas or air cannot be handled like liquids or solids, special means must be provided to effect the correct measurement of the gas or air which is passed through the meter for the purpose of determining the accuracy with which the meter registering mechanism, usually called the index, will register the same. This being a fact, it is necessary to first obtain a cubic foot measure capable of measuring and delivering without loss 1 cubic foot of gas or air. A measuring device of this description is known as a cubic foot bottle, and should be so constructed and calibrated as to deliver a cubic foot, which is the unit of measure, or the volume of 62.2901 pounds (avoirdupois) of air-free, distilled water at 60° F., weighed in air of the same temperature and at a pressure of 760 mm. (29.92 inches). It is usually so constructed with sight tubes and indicators that the 1 cubic foot of air or gas contained in the body of the bottle and in the sight tubes between the indicators may be displaced by the water entering at the level of the bottom indicator and rising to that of the top indicator.

All cubic foot bottles should be tested, badged and certified to by the Bureau of Standards, Department of Commerce and Labor, at Washington, D. C., and all indicators and adjustment-screws soldered in position by the men conducting the test, in order that the final adjustment cannot be altered intentionally or otherwise.

Upon the return of the certified bottle from Washington, it should be carefully unpacked and mounted securely in a well protected location in a room the temperature of which may be readily regulated and in which there is an abundance of daylight. Any damage to, or tampering with the standard cubic foot bottle warrants its immediate return to the Bureau of Standards for re-test and adjustment, as no chance should be taken with the primary standard by which our meter provers are calibrated and re-tested from time to time.

The cost and construction of the cubic foot bottle, the difficulty experienced in protecting same from possible damage, and the care necessary in operating, render the use of the bottle for the purpose of testing the meters for accuracy of registration impracticable.

For this purpose a more convenient piece of apparatus, called a meter prover, is provided, consisting of a cylindrical holder or bell closed at the top and sealed at the bottom by water in which it is free to move up or down, similar in action to a single lift gasholder. The bell of the meter prover is balanced by means of a cycloid and weight to compensate for the buoyant effect of the water upon same as it is immersed or withdrawn, thus insuring a constant, uniform pressure being exerted by the bell upon the contained gas or air.

The general construction and operation of the meter prover now in general use for testing the accuracy of registration of consumers' meters are so well known that no detailed description need be given. The method of calibrating or marking the scale attached to the prover bell, however, is not so well known, and consequently calls for a brief description. All provers are calibrated by means of the standard cubic foot bottle, and each cubic foot is marked on the prover scale as determined by the rise or fall of the bell as each successive cubic foot of air is either forced into or withdrawn from the bell by the operation of the cubic foot bottle.

The practice of further subdividing each cubic foot of the scale was formerly to divide the scale mathematically for a short distance above and below the 2, 4, 5, 6, and 10 cubic foot marks into 1/100 of the distance from zero to each of the above mentioned cubic foot markings on the scale, the idea being to read the error of the prover direct from the scale, considering the meter as passing 100 parts and the prover as passing the number of parts indicated by the scale. A prover scale reading of 99 (99/100 of the volume registered by the meter) was considered as showing the meter to be 1 per cent. fast, or, on the other hand, as being 1 per cent. slow if the reading was 101. As a matter of fact the meter was in error more than 1 per cent. fast and less than 1 per cent. slow, the indicated and actual percentages, however, being close enough within the small limits of error to enable the direct reading of error from the prover scale to be employed when adjusting meters on the check and open test. Most prover scales are now divided into tenths of each cubic foot and for a short distance above and below each cubic foot mark each tenth is further divided into fifths, so that a reading of 1/50 cubic foot may be read from the scale, and with a certain degree of accuracy a reading of 1/100 of a cubic foot can be obtained.

Having obtained the reading of the prover scale in feet and 1/100 of a foot, the percentage of this known volume the meters register

above or below this volume is determined by reference to a percentage of error table provided for the purpose.

The temperature of the air in the room in which the prover is to be tested and calibrated, the temperature of the water in the cubic foot bottle and in the prover tank should be the same during the operation, and in addition the air in the room should be thoroughly saturated with water vapor in order to obtain accurate results. Separate thermometers should be used for air and for water, and same should show similar readings when tested in comparison with a seasoned thermometer.

Meter provers should be tested at least once each year, a small portable 1 cubic foot prover being successfully used for the purpose in place of the slow acting, cumbersome standard cubic foot bottle. The cubic foot prover should be carefully checked against the standard cubic foot bottle previous to starting a series of tests, all precautions as to temperature and saturation being carefully observed during every test.

Every gas company should possess one or more meter provers and the necessary connections, test caps and thermometers. Separate thermometers should be provided for taking water temperatures and for taking the temperature of air in the proving room. When tested under similar conditions, the thermometers used with any prover or pair of provers should not differ more than 1° F., the range of temperatures covered by the test being from 60° to 100° F.

Meter provers should be so set that the bell will rise and fall vertically and not be subjected to any binds against the guide rods. Where the floor is cold, the tank should be raised off same by means of feet provided for the purpose or be placed upon a low table. Care should be exercised to select a proving room where plenty of daylight is available, as the prover scales are difficult to read correctly in other than a good light. Means should be provided for easily regulating and maintaining the temperature of the air in the proving room and of the water in the prover tank, as a variation of about 5° in temperature between the 2 may result in an error of 1 per cent. in the proof of the meter. When a difference of 2° between the air and water is shown, the temperature of the water in the prover tank should be changed to agree with the temperature of the air in the proving room. The prover tank should be connected with hot and cold water pipes, or with a steam pipe and a cold water pipe, or with a cold water pipe and a submerged electrical heater, for the purpose of readily changing the temperature of the contained water. Before taking a reading of the water temperature, at the time of making a change in same, the water should be stirred from the bottom of the tank by means of a long wooden paddle, in order to equalize the temperatures. The temperature of the air should not be suddenly changed by opening doors or windows or due to other causes, as the meters in the room waiting test change their internal temperatures but slowly. The greatest importance should be placed upon the necessity of setting the prover in a position where it will not be subjected to any draught and where it will not receive the direct rays of the sun. The only test for the degree of accuracy with which meters will register the passage of gas or air under different flows and pressures is that made by passing air or gas from a carefully calibrated prover through same.

The meter proving, head-pointer is allowed to make either one or two complete revolutions during a test for accuracy of registration, and the whole number of cubic feet thus registered is compared with the cubic foot readings of the prover scale in order to determine the error of the meter. In order that meters will register correctly under all conditions of flow, careful and accurate setting of the valves in relation to the positions of diaphragms is necessary at the time the meters are fitted up, or at any subsequent time when the relation existing between the diaphragms and the valves has been altered, as the result of flag arms being out of division or broken away from flag rod, flag broken away from flag rod, position of tangent changed, valve arms bent, etc. Experience has shown that it is not necessary to test meters under different rates of flow after each removal from service, as the difference in proof as shown by the tests (check and open), made under different rates of flow, is so small in meters that do not plainly show evidence of trouble that it is needless waste of time to make the proof tests at other than one rate of flow, preferably by check. Meters in which the valves are properly set will register with the same degree of accuracy the passage of air or gas through same at different rates of flow, provided there is no leakage in any part of the meter. Any damage to the working parts of the meter, which would materially affect the registration under varying rates of flow of gas or air through same, would in nearly every case be manifested and designated by some special terms, such as "works catch," or "won't pass gas." Internal or outside leaks would materially affect the proof of meters under each different rate of flow, but again, most of these leaks are detected or manifested during the pressure testing and small flame testing to which the meters are subjected upon removal, consequently there need be no concern from this standpoint. In practically every instance of inside leakage the loss is sustained by the gas company, while outside leaks in the body of the meter result in the joint loss of both consumer and company; but such outside leaks are quickly detected and remedied. As stated before, experience has shown that it is not necessary to prove meters under varying rates of flow through same each time a meter is removed from service, and the question naturally arises as to what is the proper rate to use when making a proof test of a meter removed from service in order closely to reproduce the conditions as to flow under which the meter had been operating. If all meters of a given size operated constantly under the same condition as to flow, that condition would be adopted in making a proof test; but no such ideal condition exists in practice. To meet the practical requirements it is common to specify that the test of accuracy of registration shall be made when the meters are passing gas or air at a certain rate, and the rate most commonly adopted is the number of cubic feet passing per hour, under a 15-tenths inlet pressure, which is equal to the rated capacity of the meter in number of lights multiplied by 6. Some companies, however, take the average capacity under a 3-tenths loss in pressure, of meters of the same nominal size, at the rate at which the proof test should be made. Under the present conditions of supply and demand the last method may more nearly approximate the conditions which are met in actual service, for the reason that the average hourly demand has been greatly increased within the past few years, due to the general use of gas heating and cooking appliances in the consumers' homes. The advantage of using the larger capacity test cap on the meter outlet screw, corresponding to a 3-tenths loss in pressure of the gas in passing through the meter, is the reduction in the length of time required in making the proof or check test, as it is commonly called. The same proof, however, will be obtained at both rates if the valves are properly divided, and conditions inside of the meter do not change and no leakage exists.

The pressure thrown by the prover used in making the check test is usually 15-tenths inches of water column, the check caps furnished by the meter makers being reamed and stamped for the stated capacities under a 15-tenths meter inlet pressure.

The test accepted by all gas companies and by the several public service State commissions as the proof of the accuracy of the meter, is the check or restricted rate test. This test is made by passing gas or air from a meter prover through the meter under test, all precautions as to temperatures, tightness of prover and of prover connections being carefully observed. The object of this test is to determine with what degree of accuracy the test-hand of the meter index will indicate the volume of gas actually passed through the meter during the test. The actual volume passed is shown by the prover scale, and unless the test-hand indicates a like volume the meter registers in error, being fast if the test hand indicates more than the prover scale reading and slow if indicating less.

In order to determine the error in registration it is necessary to calculate same in the case of a fast meter by finding what percentage of the gas or air in excess of the known volume passed is actually indicated by the test-hand of the meter. An illustration of this operation will no doubt make it clearly understood; the meter under test shows by the test-hand as having passed 2 cubic feet of gas or air, while the prover scale shows that only 1.95 cubic feet actually passed. The difference between the indicated volume (2) and the actual volume passed (1.95) is 0.05 cubic foot, and the percentage 0.05 as of 1.95 is 2.56, or expressed in another form:

$$\frac{(2 - 1.95) \times 100}{1.95} = 2.56 \text{ per cent. fast.}$$

The practice of reading the percentage of error direct from the prover scale should be discouraged, as such readings give only close approximate results for small errors, and decidedly incorrect results when the difference between test-hand reading and prover scale reading are great. Taking the conditions stated in the above example, and attempting to use the prover scale direct to obtain the error, we find that the meter recorded 2 cubic feet passed, and the prover only 1.95 cubic feet, or 97.5 per cent. of the gas registered by the meter. It is obvious that it would be wrong to say that in this case the meter is 2.5 per cent. fast, for the 2 cubic feet indicated by

the meter is not the quantity actually passed, and consequently cannot serve as the volume of which we are to obtain the percentage of error in meter registration.

These conditions can be more clearly shown by assuming greater differences between meter and prover readings.

Meter Reading. 2 cubic feet. Prover Reading. 1 cubic foot.

$$\frac{(2-1)\times 100}{1} = \text{per cent.}$$

In this case the meter is 100 per cent. fast, for the reason that the test hand registered twice the known volume actually passing through the meter.

Meter Reading. 2 cubic feet. Prover Reading. 1 cubic foot.

$$\frac{(2-1)\times 100}{2} = 50 \text{ per cent.}$$

In this case the meter is considered only 50 per cent. fast, the prover scale reading but half that of the meter test hand; or, in other words, the known volume passing through the meter is but 50 per cent. of the volume registered by the meter test hand, while it is self-evident that the meter actually did register twice the known volume that passes through the same, and must, therefore, be 100 per cent. fast.

Take for example the following conditions:

Meter Reading. 2 cubic feet. Prover Reading. 2.50 cubic foot.

$$\frac{(2.5-2)\times 100}{2.5} = 20 \text{ per cent.}$$

The meter in this case would be 20 per cent. slow, the meter registering but ⅘ of the gas passed. The incorrect method of obtaining the error in meter registration is as follows:

$$\frac{(2.5-2)\times 100}{2} = 25 \text{ per cent.}$$

This explanation is called for, due to a recent publication covering the subject of meter testing, in which the author claimed that the method of determining directly from the prover scale readings the percentage of error with which the meter registered the volume passed was correct and preferable to the method of determining the error of registration on the basis of volume actually passing through the meter in comparison with the volume shown by the meter test-hand, as having passed. This claim cannot be substantiated, as the above examples show.

The inaccuracy of meter index mechanisms is a question that has given rise to considerable thought and discussion lately, but from the consumers' and gas companies' standpoint there should be little apprehension of overcharge or loss from this source. Under the shop practice that prevails to-day, mechanisms are invariably made so as correctly to register the revolutions of the test-hands, and the writer does not recall a single case of incorrect gearing in a gas meter index mechanism. It is true that a meter may be fitted up by a careless fitter, with the wrong size of index, but this would be readily detected by the man who checked up the size of proving head in comparison with the volume of gas passed by the meter prover at the time of testing and adjusting the meter in question. Instances of this kind are extremely rare, and any attempt to separately check up each index after same is mounted in the meter, would only show what the meter tester is now pretty certain to discover in his regular duties; therefore, it appears that no such inspection is necessary.

The pressure at which the gas is measured in the dry meter under ordinary practice does not appear to have any appreciable effect on the proof of the meter, and this is only to be expected, as under any pressure of the inlet gas both sides of the diaphragm are subjected to almost the same pressure, the difference being the loss due to the passage of the gas through channels and valves and in operating the working parts of the meter. Were it not for this slight difference in pressure between inside and outside of diaphragms or *vice-versa*, the meter would be deprived of its motive power and would not operate.

Most gas companies do—all gas companies should—test all new meters for accuracy of registration upon receipt of same, all new meters thereby being tested at least two or more times before same are placed in service. Meters removed from service should be tested as quickly after removal as is consistent with the time required for the meter to acquire the temperature of the proving room, depending on the original difference in temperature between the two. In some instances 1 hour is sufficient time, while in others 5 hours or even 12 hours are required. Too much emphasis cannot be placed on the importance of immediately capping or corking the pipes, or tubes, upon disconnecting the meter at the consumers' premises, as the action of the air entering the meter may cause a change in the proof, so that same when made in the shop would not correspond with the actual proof of the meter when passing gas in service. For the same reason the first proof of a meter removed from service when either gas or air is used as the testing medium, should be considered as nearest the actual proof of the meter under active service conditions at time of removal just previous to the test. Previous to proving, about five revolutions of the tangent should be made by passing air or gas through the meter in order to purge same of accumulated vapors and to insure that the working parts are free to operate.

This first proof, even when using gas supplied through the piping exposed in the proving room is, in the vast majority of cases, somewhat faster than the proof of the meter when passing gas at the consumers' premises. The use of air from the proving room, or of gas which has passed through any piping of a slightly higher temperature than that of the meter under test, will produce the same effect on the meter, causing successive proofs, in some cases up to 20 or more in number, to show progressively faster, the meters proving as much as 3 per cent. faster on the last proof than they did at the start.

The general practice throughout this country, with one or two exceptions, is to test both new and old meters with air. There apparently is no decided advantage gained by using gas for the purpose, for the reason that a dry gas will pick up the light oils and vapors in passing through a meter under test, thereby affecting the proof to the same extent as does air from the proving room. This question, no doubt, may seem unnecessarily brought forth, in view of the fact that no State or municipal regulations specify whether gas or air is to be used in making the proof test of the meter; however, the fact should be constantly borne in mind that the first test with either gas or air, upon removal from service, is the nearest to the correct proof of the meter in service, and consequently any other proofs of a meter may not be accepted as correctly representing the conditions under which the meter worked. Experiments have been made with the use of air and gas, both saturated at the temperature of the meters under test, with the light vapor given off from condensation removed from other meters. The results obtained were very satisfactory, each successive proof remaining constant, showing that conditions of diaphragms and valves did not change as a result of the saturated air or gas passing through the meters under test.

The gas entering a consumers' meter is, according to the season and to the relation between ground temperature and cellar temperature, sometimes saturated with water and oil vapors and sometimes it is not. This point is clearly explained by Mr. J. M. Rusby in his paper, "Consumers' Meters: Causes of Variation in Proofs," read before this body in 1906. The accuracy of the meters, therefore, varies somewhat with the seasons, but without injustice to the consumer, as these seasonal changes tend to neutralize each other. It is evident, however, that, after a meter is removed from service and ready to be tested, the air or gas used in the test should be in such condition as to cause no change *during the test* in the condition of the meter valves and diaphragms; therefore, a saturated air or gas should be used. This should be done whenever very accurate results are desired, corresponding to the proof of the meters in service, and when consecutive tests are made upon removal of the meter and each test accepted as representing the conditions as to proof under which the meter passed gas in actual service. The air or gas used in making the test may be thoroughly saturated by causing same to pass through a small saturation box placed close to the inlet to the prover.

The practice of introducing a considerable quantity of oil into the diaphragm compartments of ths meter, and known as "dipping," appears to be growing. The writer can say from experience that dipping meters hold their proof, on successive tests with air or gas, much better than do non-dipping meters, due no doubt to the diaphragms being saturated at all times with a less volatile oil than in most cases are the diaphragms of non-dipping meters.

The practice of making meters dipping has resulted in an increase in *net error* slow of the meters tested upon removal from service. A glance at tabulated results of meter tests, covering, say, a period of 1 year, will readily show why this is so. Dipping meters as a class prove within smaller limits of error than do non-dipping meters, the general tendency, however, being to err on the slow side, the fast meters constituting a very small percentage of the total dipping meters tested. The average fast error is smaller for dipping than it is for non-dipping meters, as is also the average slow error; comparing dipping with non-dipping meters, of the total number tested, a smaller percentage tests fast and a larger percentage tests slow, re-

sulting in an increase in the *net* error slow. This result seems to be a step in the right direction, for, admitting that the simple mechanism constituting a dry gas meter is liable to err, as is also the finer mechanism constituting a watch, or finer still, a human being, it is to be desired by every gas company that the error in meter registration shows against the company rather than against the consumer. The ideal condition would be to have all meters register absolutely correct under all the varying conditions to which they are subjected in service, but as this condition has not been attained as yet, despite the acknowledged correctness of principle of the present 2-diaphragm, dry gas meter, and the constant endeavor being made to improve the constructive details of same, the next best thing is to wipe out or materially reduce the fast error and have all of the meters either correct or within very small limits of error on the slow side.

The increased slow *net* error of dipping meters should not cause any alarm among gas companies, for the reason that from present indications the increase will not exceed 1 per cent. over the slow net errors shown for non-dipping meters. While dipping meters as a class prove within smaller limits of error, the meters showing a fast error being greatly reduced in number, at the same time those showing a slow error are greatly increased in number, the average error in each case being within smaller limits for dipping than for non-dipping meters.

The quality of gas and the temperature conditions are important factors affecting the proof of the meters in service. Meters which are required to pass coal gas are subjected to less variation than are meters through which pass a mixed gas, a water gas or an enriched oven gas. The most important factor in producing a variation in proof is the temperature change to which meters are subjected, as shown by Mr. John M. Rusby's paper referred to above. With the possession of this knowledge it becomes the duty of those responsible for the setting of meters to select locations in which they will not be subjected to sudden changes in temperature or to great difference in temperature to that of the inlet gas.

The importance of exercising great care in adjusting meters to correct proof, and the difficulty in maintaining this proof in service, should be apparent after reading the above statements. In the first place, slight errors are liable to be made in standardizing the cubic foot bottle. In the use of the cubic foot bottle great care must be exercised to have the water at the proper levels in the sight tubes, at the start and finish of any test; the thermometers used must agree under similar temperature conditions; similar temperatures of water and air must be maintained throughout the test, and the air of the room must be thoroughly saturated with water vapor to prevent change in volume of the air making a cubic foot test. Having exercised every precaution in marking the cubic foot capacities on a prover scale, a slight error may be easily made in marking the scale in a permanent manner and in laying off the sub-divisions of each cubic foot, and this, together with the personal error in adjusting the scale to zero at the start and in reading same at the finish of a test, to say nothing of the effect of the temperature changes and of any unnoticed leakage, render the operation of proving meters for accuracy of registration a very close approximation rather than an exact science. The meters that are adjusted to the greatest degree of accuracy permissible previous to being placed in service are subject to wear of moving parts, deterioration of diaphragms, effect of condensation and impurities in the gas, and the effect of temperature variations, all tending to affect the accuracy of registration.

These statements are made in order to show the necessity of allowing for variation in the proof of meters within small limits of error, either fast or slow, when attempting to define what constitutes a correct meter. The Railroad Commission of Wisconsin showed its appreciation of the difficulties experienced by the most exacting companies in proving meters and maintaining same within small limits of error by adopting the following: "The accuracy of a gas meter may be defined in terms of the percentage with which it registers the actual volume of gas which passes through it. In the present state of the meter art it is impossible to secure a meter which is absolutely accurate, and which will remain accurate over a period of time. It is, therefore, necessary to define the term 'accuracy' in such a way as to permit meters which fall within a small limit of error being considered as giving good service. The common method of testing the accuracy of a meter is to compare its reading with the volume of gas, as measured by the well-known 'meter prover.' It requires more than ordinary skill to measure the volume of gas with the meter prover so as to be certain of its value within ½ of 1 per cent., and ordinarily, in making the measurement, errors of observation or inaccuracy of the meter prover itself can amount to 1 per cent. Inasmuch as commercial meters cannot be made and adjusted to keep within this limit, a further allowance appears necessary, and for such allowance 1 per cent. seems a figure practically attainable."

The common practice in this country and in Europe is to consider a meter correct which registers within 2 per cent. above or below the point of absolute correctness, as determined by the prover scale reading. On account of the difficulties experienced in endeavoring to attain accurate measurement, and the impossibility of obtaining a perfect measuring device, meters that prove within this limit should for all practical purposes be considered as correct.

Meters, in order to be properly tested, should be carefully removed and taken to a thoroughly equipped room where all precautions necessary for making an accurate test may be taken. No attempt should be made to prove a meter on consumers' premises, as at the best this practice will produce very unsatisfactory results and entail greater expense than would removal to a proving room. The attempt to prove one meter against another by passing gas or air through the meters connected in tandem cannot be too strongly objected to, for the reason that there is no positive assurance that the test meter so used will maintain its proof under the various conditions under which it must necessarily be used. Consequently, when the standard is subject to change, the test so made cannot be accepted as reliable. Complaint meters used in tandem with consumers' meters for the purpose of recording hourly consumptions of gas for a number of consecutive days, in order to demonstrate certain conditions of demand in order to take care of a complaint on the part of the consumer, should not be considered as a test of the accuracy of the consumer's meter so tested. One large gas company has taken the precaution to remove the indexes from its complaint meters in order that it will be impossible to prove one meter against the other, and has even gone farther by terming the complaint meter a complaint register, and always referring to same in the terms last mentioned. This does not necessarily mean that the complaint register or any special test meter that might be employed is not correct; but, owing to the uncertainty of same, the difficulty of close readings of meter indexes, the uncertain light and difficulty encountered in maintaining constant temperatures, it is plainly evident to anyone possessing a knowledge of meters and meter proving that to expect consistently reliable tests under such conditions is out of the question.

The periodical testing of consumers' meters is one of the necessary features of the gas business, and in most cases a profitable one for the companies. It seems most desirable that gas companies should make at least one test of every meter in service after a period of years, the length of which should be determined by the summary of tests of meters removed from service, such summaries being arranged according to the years of service. Three years has been decided upon in some places as the maximum time that meters should remain in service without removal for test, but it is a debatable question whether this should not be extended to a longer period.

The summaries of all meters tested for a year in practically every instance show the net error to be slightly slow, averaging about 1 per cent. against the gas companies. When the results of tests are tabulated according to years of service since previous test, the net error consistently becomes slower as the length of service increases. This is true of both dipping and non-dipping meters, but it is probable that dipping meters will not continue to increase in slowness as the years go by at as fast a rate as do the non-dipping meters, although there has not been sufficient time to demonstrate this point.

The practice of changing meters every 3 years, or after any other arbitrarily decided term of service, does not appear a very intelligent handling of the meter question, either from the standpoint of protecting the consumer or of safeguarding the gas companies' interests. One large company stopped its practice of changing meters after being in service 3 years, for the reason that the condition of the meters (all non-dipping) so changed was found to be such as to render the expense and annoyance entirely unwarranted. This same company started a record of meter tests, arranged according to years of service and class of meter. In the case of the non-dipping class of meters, it has shown that, after 7 years of service, the net error slow increased rapidly, showing conclusively that meters of this class should be changed at the end of 7 years, in order to protect the company against serious loss. The record in question also showed that the average fast error became smaller, while the average slow error became larger as the number of years increased.

The records of dipping meter tests do not cover a sufficient number of years to date, to give any indication as to the maximum length of

time that meters of this class may be allowed to remain in service without causing serious loss due to a slow net error.

Investigation has shown, and will unnoubtedly continue to show as a whole, that meters in service give a net error in favor of the consumer, this net error becoming larger in favor of the consumer as the length of service increases, so that any periodical changing of meters, forced upon gas companies with the idea of protecting the consumer, does not work to that effect in practice, nor does it necessarily benefit the company, as the expense incurred in changing meters at intervals of every few years might greatly exceed any loss sustained, due to slow errors of the meters, if same were allowed to remain in the consumers' premises.

The only logical method of determining the number of years a meter should be allowed to remain in service is by careful study of summaries of proofs, kept according to years of service, and a determination of the cost of changing and testing the meters to offset the loss due to the slowness of the meters after certain length of service, any other method being unreliable and resulting in unwarranted expense.

The practice of several large gas companies of frequently changing large meters supplying gas continuously for a number of hours each day, to engines or other appliances, appears a good one. By this method the meters passing large quantities of gas are kept within smaller limits of error, the companies being subjected to less liability of loss of large quantities of gas, due to slow registration of the meter, as might easily be the case were the large meters allowed to remain in service, subject to the excessive wear of moving parts, due to the long continued period of operation at or near maximum capacity. Records of tests of large meters show, however, that they hold their proof equally as well as do small meters for similar periods of service, so it does not mean that, because a meter is large in size or capacity, it will become slow quicker than a meter of smaller size or capacity; but rather the conditions under which a meter is required to operate should be the important factor in determining the maximum period of time same ought to be allowed to remain in service.

Before leaving the subject of accuracy of consumers' meters, the prepayment meter mechanism should be considered. Every prepayment buying mechanism operates in conjunction with the index mechanism of the meter, so that any discrepancy between money lifted from cash box, taken in consideration with the credit shown on the credit dial and the meter index reading, is readily discovered by the clerks who post the consumers' ledgers. Any money lifted in excess of the index and credit shown belongs to the consumer, and should be returned to him or credited to his account on the gas companies' books. Any shortage may be due to prepayment mechanism defects, to theft, to mistakes of collectors in counting the money lifted or to other causes. When the shortage is sufficient to warrant removal of the meter, and the examination of prepayment mechanism upon removal shows that same is defective, thereby enabling consumer to obtain more gas than paid for, the gas company is justified in asking the consumer to pay the shortage, otherwise the loss is borne by the company. The operation of the prepayment mechanism of any meter is in no way affected by the error in proof of the meter. A prepayment meter geared for $1 gas will give a 250 cubic foot index reading for each quarter, regardless as to whether the meter is fast or slow.

The supposed incorrectness of the gas meter has been for many years the subject of newspaper jokes, and many present day consumers have the idea firmly rooted in their minds that the meter index reading has no relation to the quantity of gas actually consumed. The gas companies are partly to blame for this misconception of what is actually a very accurate measuring device. Gas is so convenient and so easily wasted that nothing is easier than for a consumer to use a lot of gas between bill periods and forget about it, or to have servants or children waste the gas to an extent, not much for any one day, but, when spread over 30 or 90 days period, so large that the resulting bill makes him feel that he is being robbed. If no other advantage accrues to the gas companies in the practice of late of appointing public service commissions whose duty is to test meters at the request of any consumer, one advantage will certainly result in that the public will come to know what the gas companies have always known, that the error in gas meter registration is always very small, and in most cases in favor of the consumer.

In conclusion it may be truly said that gas companies and meter manufacturers thoroughly realize the absolute necessity of accuracy in gas meter registration, and have worked hand-in-hand to attain the desired results, and it is no exaggeration to say that the meter now occupies a splendid position as a remarkably accurate commercial gas measure.

The President—Mr. Castor's very interesting paper on a very interesting subject, is before you for discussion.

Mr. McDonald moved a vote of thanks to Mr. Castor, which was seconded and carried.

The President—The last paper is by Mr. H. M. Papst, on

REMOVAL OF ORGANIC SULPHUR FROM GAS.

Mr. McDonald—Mr. Papst is not here and the paper is very technical. Anybody interested in the subject will want it in his laboratory, but very few people could digest it by hearing it, so I move that it be considered read, and printed in the minutes. [Adopted.]

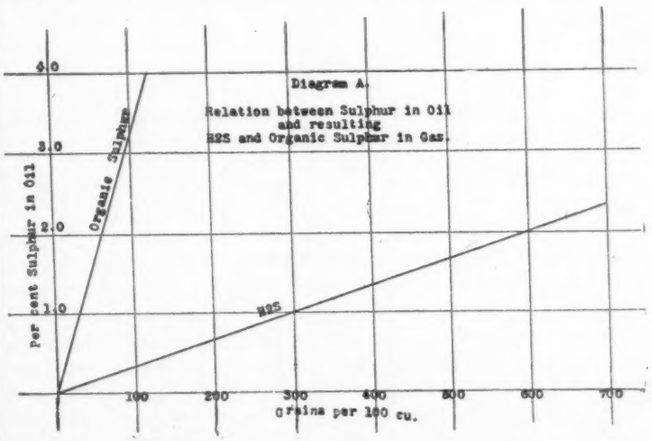
The Papst paper is as follows:

What It Is.—The term "Organic Sulphur" is used to denote that portion of the sulphur in illuminating gas other than that in combination with hydrogen. Sulphur in the form of sulphuretted hydrogen is that part which is removed by the usual oxide of iron purifiers. The organic sulphur is not removed by this means, and generally not at all, unless special means are employed to eliminate it.

The sulphur in the form of sulphuretted hydrogen is tested for qualitatively by strips of paper impregnated with acetate of lead. Therefore, many gas men who are not chemists are not aware that a goodly proportion of the total sulphur is being distributed with the gas.

The organic sulphur consists mainly of bisulphide of carbon. The other principal organic combinations are thiophenes, mercaptans and sulpho-cyanides. Both sulphuretted hydrogen and the organic sulphur compounds originate, of course, with the sulphur in the gas making materials, whether coal or oil. Materials very high in sulphur will give a raw gas containing high percentages of both forms. Some coals and oils are so high in sulphur that they cannot be used for making illuminating gas, although they may be otherwise well adapted for the purpose. This has a tendency, of course, to narrow the selection of raw materials to those low in sulphur. Generally speaking, the amount of these impurities is directly proportional to the percentage of sulphur in the raw material.

The accompanying diagram shows the amounts to be expected when the gas is manufactured from crude oil alone.



How It Occurs.—The study of these sulphur bodies has shown that they are generally formed at very high heats, and that the amount in grains per 100 cubic feet rises faster than the increased amount of gas obtained by higher heats. It seems likely that secondary reactions are taking place in the generator or retort whereby the sulphuretted hydrogen resulting from the decomposition of the sulphur bodies in the raw material recombines with the carbon or carbon compounds to form organic sulphur combinations. Even after the gas has left the place of generation there seems to be a possibility of the further formation of organic sulphur. It has been observed that the amount of the impurity is lower in the finished gas when revivification takes place in the usual way, by blowing or sucking through a current of air, than when the same is accomplished by admitting continuously a small percentage of air and a periodical reversion of the position of the purifiers. This may be due partly to an actual cleansing of the material by the blowing, or possibly by secondary reactions taking place between the sulphuretted hydrogen and various organic bodies present in the oxide. The following has been suggested as likely to take place.

Hydrogen sulphide and thio-carbonilide can react as follows to form bisulphide of carbon and aniline:

$$CS < \begin{matrix} NH.C_6H_5 \\ NH.C_6H_5 \end{matrix} + H_2S = CS_2 + CS < \begin{matrix} NH.C_6H_5 \\ NH.C_6H_5 \end{matrix}.$$

This is liable to take place when the amount of hydrogen sulphide is relatively large, on account of the influence of mass action. The equation is capable of working backward, and is likely to do so should clean gas, free from hydrogen sulphide, be passed through a purifier which has not been revivified. In that case it is possible for the clean gas to regenerate hydrogen sulphide and leave the box dirty. Such a reaction has been actually observed in practice. However, the sum total of the reactions amounts to not over 9 or 10 grains per 100 cubic feet. In oil gas, and coal gas as well, there are also cyanogen compounds which are capable of acting in the same manner.

First Struggles and Experiments Leading to the Reheating Process.—It was early recognized by this company that the expense of removing these impurities was insignificant in comparison with the benefits to be derived. This was even before the change of the generating process from water gas to oil gas. Water gas made from crude oil contained about 30 grains of sulphur per 100 cubic feet, and this amount, which most gas companies consider innocuous, was causing a great deal of complaint. Of course, it was out of the question to distribute gas containing the greatly increased quantities due to the use of oil alone for gas making. Experiments were, therefore, instituted to find a better method than the old sulphided lime method. This method was tried and at once found to be uncertain and unsatisfactory. The sulphided lime has at times a tendency to increase instead of diminish the amount of impurities to be removed. The method will, with some uncertainty, remove from ½ to ¾ of the organic sulphur at a cost of from 3 to 4 cents per 1,000. The apparatus and ground space are about equal to that necessary for the hydrogen sulphide removal.

One of the earliest experiments was that of washing out the impurity with light tar oils and subsequently with crude oil. In both of these attempts the high vapor tension of bisulphide of carbon proved a bar to success, although quite successful for retaining naphthaline, which has a comparatively low vapor tension. The idea of reheating the gas to cause a breaking down of the impurities was then tried on a comparatively large scale. The plant consisted at first of a 30-inch cast iron pipe, filled with scrap iron, heated in a brick oven and connected to two 6-foot by 6 foot purifiers. Owing to the large size of the pipe the best result was 50 per cent. of the organic sulphur broken to hydrogen sulphide. This arrangement was replaced by five 4-inch tubes and eight 3-inch tubes, 8 feet 6 inches long. The results were quite satisfactorv, and the tabulated data are as follows:

Flow of Gas Cu. Ft. per Hour.	Temperature, Deg. F.	Grs. of H_2S per 100 Cu. Ft. in Reheated Gas,
19,700	662	15
17,000	860	15
15,000	932	25
14,200	770	50
10,200	968	50

The last test showed 65 per cent. of the impurity broken down.

Description of the Process.—Since the experiment showed the unsuitability of the tubes to reheat the gas, an internally heated apparatus was designed, large enough to handle the output of the works. It consists of 2 steel shells, similar to the ordinary water gas superheater, lined with firebrick and filled with staggered checkerwork. Between these two is another shell or generator, similarly lined, but about half as high, equipped for burning either solid or liquid fuel. For this purpose it is connected up on either side with the bottom of the reheaters. The connections are provided with water-cooled valves. The reheaters are provided with the regular stack valves and offtake pipes dipping into a common wash-box. These shells are alternately heated from the central generator. The purified gas is alternately admitted to the bottom of each reheater and passes through the hot bricks, where the organic sulphur is broken down to hydrogen sulphide. After passing through the washbox, scrubber and condenser, it is purified from hydrogen sulphide in secondary oxide of iron purifiers, thence passing into the station meter. The apparatus is kept at about 1,200° F. The exhauster works continuously, since one reheater is always cut in before the other is taken off.

The plant is very cleanly and constitutes a show place. There are no nuisances in the way of by-products. Only one attendant is necessary during the day and one at night, working 11-hour shifts, the plant being shut down from 7 A.M. to 9 A.M., while the oil gas sets are down. The washbox is never cleaned, since there is no tar or lampblack. The checker-work in the reheater should last indefinitely, as it is not subject to wear and tear.

While our plant is not equipped with regenerative effects, such will add materially to the efficiency of the process. The issuing gas will be made to preheat the entering gas by means of a heat exchanger similar to a condenser, whereby the fuel charges will be cut in half. The ground space necessary for the reheater intallation is about one-fifth of the generating capacity. That for the secondary purifiers is about a third of the primary capacity. It is obvious that, in case of disaster overtaking the gas making sets, we have in the reheaters admirable oil gas or producer gas generators.

The secondary purifiers are available to act as catch boxes for any traces of hydrogen sulphide, thus decreasing the amount of investment on the primary purifiers necessary to handle peak loads.

The life of the material in the secondary purifiers is from 5 to 6 times that of the primaries, due to the small amount of hydrogen sulphide to be removed and the perfect cleanliness of the reheated gas.

Results of Reheating the Gas.—The apparatus will remove with the utmost certainty 70 per cent. of the total organic sulphur. Inasmuch as there is no tar or lampblack produced by heating the gas in this manner, the overflow water being absolutely clear, the hydrocarbons are but slightly affected. As a result, the candle power losses are insignificant. This is in any case a matter of indifference, as the oil or coal per 1,000 is the same whether the splitting-off of hydrogen necessary to bring the gas down to the required candle power is performed in the generator or the reheater. One gets the increased volume in either case.

Theory of the Reheating Process.—Since it is well known that the higher temperatures are favorable to the production of larger amounts of the organic sulphur, it seems possible that an action similar to that of the decomposition of steam by incandescent carbon may take place.

The reaction for the formation of water gas is at the first stage as follows: $2H_2O + C = 2H_2 + CO_2$.

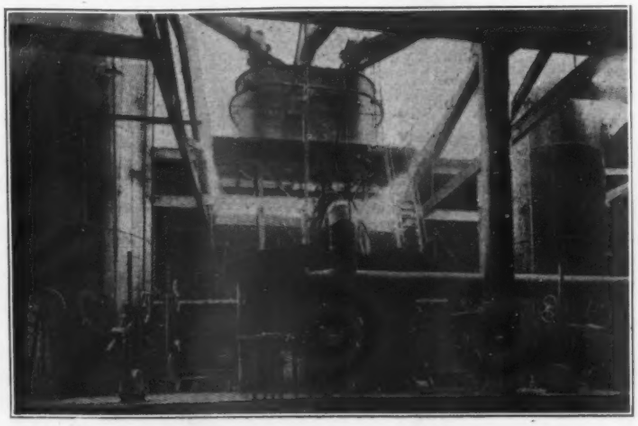
This reaction is the more efficient in volume with increased heats, as shown by Bunte's experiments. We are now reminded that sulphur is of the same chemical family as oxygen, and let us replace the oxygen in the above equation by sulphur, we obtain: $2H_2S + C = 2H_2 + CS_2$.

This analogy holds good in every way we look at it, but more especially when we come to reverse the equation, as in the reheating process. It is more than likely, therefore, that the carbon bisulphide is in the process combined with nascent hydrogen either from water vapor or hydrocarbons, as follows: $CS_2 + 2H_2 = 2H_2S + C$, or $CS_2 + 2H_2O = 2H_2S + CO_2$.

Now reversible reactions are rarely complete. There is always a balance established between the two sides of the equation, on account of the law of mass action, according to which there is a continual interchange of atoms from one side to the other. According to the functions of the reaction, the balance is more or less in favor of one side. This condition persists until the conditions are changed or until some of either side is removed from the sphere of reaction. This will enable a readjustment which will again persist.

Now, in the generator we have established an equilibrium between the hydrogen sulphide and the bisulphide of carbon, which under oil gas conditions and temperature is about 8 or 9 to 1. By purification and carbon removal we eliminate one side of the equation. When we reheat, therefore, we enable the other side, in this case the carbon bisulphide, to redistribute itself according to the same ratio into a fresh portion of the hydrogen sulphide and a small remainder of carbon bisulphide. Should we reheat at lower temperature, less carbon bisulphide would revert to hydrogen sulphide. At 1,200° F. the ratio is about 3 to 1, which is very nearly sufficient for our purpose. Therefore, the reheating process is merely re-establishing the temperature of reaction in the generator after the elimination of a part of the equation by purification. For a second reheating, the hydrogen sulphide removed from the first reheating would in turn do the same, and so on.

Cost of Operating.—The plant has been in successful operation at the works of the Portland Gas and Coke Company since August, 1908. The good results obtained from the use of this process have shown themselves not only in the laboratory but also in the plainly expressed satisfaction of the public. Information as to the operating cost of the plant can best be furnished by submitting the figures for 1909 of the Company. The figures for amount of sulphur remaining after reheating and secondary purification, being monthly averages of street gas, and including setbacks from various causes, such as small purifying capacity and poor purifying material of the secondary



Reheating Process at the Plant of the Portland (Ore.) Gas and Coke Company.

purifiers and lack of blast pressure, hardly do the process full justice. The total amount of gas reheated was 817,000,000 cubic feet, with a maximum per day of 4,000,000 cubic feet.

Month.	Heating Oil, Gals. per 1,000.	Labor, Cts. per 1,000.	Grains of Organics per 100 Cubic Feet. Before.	After Reheating.	Amount Removed.
Jan.....	0.35	0.0026	58.8	16.9	41.9
Feb.....	0.21	0.0025	50.0	17.3	32.7
Mar.....	0.18	0.0030	49.0	15.5	33.5
Apr.....	0.50	0.0042	58.8	14.2	44.6
May.....	0.49	0.0032	53.9	15.3	38.6
June.....	0.55	0.0031	68.5	18.0	50.5
July.....	0.56	0.0035	68.9	20.8	48.1
Aug.....	0.48	0.0031	66.7	18.2	48.5
Sept.....	0.42	0.0026	57.8	14.7	43.1
Oct.....	0.33	0.0024	62.3	15.5	56.8
Nov.....	0.31	0.0020	62.1	18.8	43.3
Dec.....	0.30	0.0018	49.2	18.1	31.1
Annual report..	0.35	0.0026	58.8	16.9	42.9
I would consider the following a fair average of what the plant will do.....	0.50	0.0026	60.0	13.0	47.0

Conclusions.—The reheating process has opened the door to the use of inferior grades of gas coals and oils low in price, which heretofore could not be used on account of their high sulphur contents. A difference of only 50 cents per ton in the price of two coals, one high and one low in sulphur, means 4 cents increased profits per 1,000 cubic feet in the holder, allowing 1 cent per 1,000 cubic feet for the removal of the additional sulphur and interest on plant investment. Clean gas is the best asset a gas company can have. Any reasonable expense at the works that will produce satisfied consumers is money well invested. Experience shows that satisfied consumers produce an increased return per mile of main investment. On the other hand, a dissatisfied public invites hostile legislation and unprofitable competition.

The President—Now, gentlemen, we have some routine business to transact. The first will be the appointment, as is the custom, of the

Committee on Public Relations and the Technical Committee.

I have been requested by Mr. McDonald, the President-elect, to name the following gentlemen for the first named Committee:

John Williamson, Chairman.
W. F. Douthirt, E. C. Jones,
A. C. Humphreys, C. F. Prichard,
S. J. Glass.

Technical Committee.

W. H. Fulweiler, Chairman,
V. F. Dewey, M. Webb Offut,
W. E. McKay, J. M. Morehead,
Henry L. Doherty.

That concludes the appointment of the General Committees for the next year, by request of the President-elect. The next thing is the

REPORT OF THE COMMITTEE ON PRESIDENT'S ADDRESS,

which was read by Mr. Edward G. Pratt (Chairman), as follows:

Mr. President and Gentlemen of the American Gas Institute: The Committee, to whom was referred the address of the President, begs leave to report as follows: Your Committee commends for your thoughtful consideration the business-like, practical and timely address of the President, and suggests the careful reading of it, because there are thoughts suggested therein which are of vital importance to the welfare of the Institute at this time. In making this statement your Committee has in mind more especially that portion of the address which refers to the success and life of the Institute, and what was anticipated in its organization when the three older associations were consolidated into this one.

Your Committee is in hearty accord with what the President suggests respecting the preparation of papers, the work and assistance given by those who are carrying on the affairs of the Educational Class; also, what he says respecting the "single standard" instead of "separate standards" for light and power.

We heartily approve of the ideas advanced respecting "government by commission" and what he says respecting public utility companies and their treatment of their customers in the communities in which they are doing business.

It may be outside the province of this Committee to refer to the question of membership, but it appears to us that the net increase of membership in this Institute is by no means what it ought to be. And it is the business of the officers to ascertain the causes for this comparatively small increase and apply the remedy that will be the means of producing better and more healthy results in this respect; and it is the duty of the members to help increasing this membership by rendering all the assistance possible toward making the Institute the power for good to its members, and to the business, which was anticipated when organized.

PAUL DOTY,
JOHN WILLIAMSON,
EDWARD G. PRATT,
} Committee.

On motion the report of the Committee was adopted as read, and ordered placed on the minutes.

The President—Next is the

REPORT OF COMMITTEE ON NEXT PLACE OF MEETING,

which was read by Mr. A. E. Forstall, as follows:

Your Committee on Place of Next Meeting report as follows: Representatives of the Chamber of Commerce and of the City Government of Richmond, Va., presented to us a very hearty invitation to hold the next meeting in that city. This invitation was also given in letters from the Governor of Virginia and the Mayor of Richmond. Your Committee wishes to express its deep appreciation of the spirit which prompted the presentation of this invitation verbally by personal representative of the organizations named, and of the eloquence and cordiality with which it was delivered. We also appreciate the attractions of Richmond as a convention city. It has also been suggested to the Committee that St. Louis, Mo., would be an appropriate place for the meeting.

There have, however, been presented to the Committee important reasons for not making any definite recommendation now, and we, therefore, ask permission to defer making any recommendation at this time with the understanding that we will report later to the Board of Directors, and that the Board of Directors will have power to act upon this report when made.

There have been handed to the Committee telegrams from the Mayor of New Orleans inviting the Institute to hold its 1915 meeting in that city. The Committee having no jurisdiction in this matter have returned the telegrams to the Secretary without action.

JAS. W. DUNBAR,
J. M. MOREHEAD,
A. E. FORSTALL,
} Committee.

The President—Gentlemen, you have heard the report of the Committee on the Next Place of Meeting. What is your pleasure?

Mr. Egner—If I am in order I should like to offer a resolution of an amendment to that report. I move that the next meeting of this Association be held in Richmond, Va. We have met twice in New York, once in Chicago, once in Detroit and once in the District of Columbia. The Institute has never gone South. Now we have received a very courteous invitation to go there, and we have the assurance of ample accommodations, historic interest and a hearty welcome, and I do not see the use of letting that lie over. I can say personally that I believe each member of the Committee that has just reported would be willing to go to Richmond, and I think there is nothing to be gained by delay. If it is in order, I move that the American Gas Institute shall meet in 1911 in Richmond, Va.

Mr. McDonald—I presume discussion on that motion is in order and I want to say that there is a most excellent reason for according to the Committee the additional time for which they have asked. The Commercial Gas Association, of which a great many of our members are also members, has requested us to defer settling that question until their meeting, when they can appoint a similar committee.

Mr. Egner—The American Gas Institute was formed by the union of the American Gas Light Association, the Western and the Ohio Associations, and soon after that some gentlemen started two other Associations, and many of us joined them. Now we don't want to wait and see what they decide on. I think the American Gas Institute can decide for itself and do it right now. [Calls for question.]

The President thereupon put the motion of Mr. Egner that the next meeting place be Richmond, Va., and the motion was declared lost. He then put the motion, made by the President-elect, that the place of meeting for 1911 be left for the present with the Committee, to consider and report to the Board of Directors, and that the Committee be continued until the conclusion of their work. [The question was called for, and, on being put to a vote, it was declared carried.]

Mr. McDonald—Gentlemen, I hope and feel that this action does not at all preclude the Committee from deciding on Richmond, Va. If I had nothing to consult but my personal feelings in the matter, that is where I should like to go.

The President—Section 10 of the By-laws and Section 33 of the Constitution provide that a meeting of the Directors shall be held immediately after the session, in order to elect a Finance Committee and a Membership Committee. The conditions are such that that meeting can only be held to-morrow on the excursion boat, and I trust there will be a sufficient number of the Directors present to enable us to form a quorum and have a meeting in accordance with these two sections.

Mr. McDonald—I want to move a vote of thanks to the Committee on Arrangements and the various sub-committees. I do not think a convention has ever been better taken care of. Things have worked smoothly, due to the forethought for the comfort of the members. [Seconded.]

The President—It has been regularly moved and seconded that a vote of thanks of the Institute be tendered to the Committee on Arrangements and the various sub-committees, for the efficient manner in which they have performed their duties at this meeting. All in favor of that motion will signify their consent by saying Aye. [Carried unanimously with applause.]

Mr. McDonald—I don't want to slur over that matter by including everything in one motion. The officers of the New York Edison Company have favored this convention with a great courtesy, and the officers of the United States Navy Yard have presented us an invitation giving us the freedom of the Yard. I move a vote of thanks of the Institute to the officers of the New York Edison Company and to the officers of the United States Navy Yard. [Seconded and adopted.]

Mr. Pratt—I do not know whether Mr. McDonald's motion covers the thanks of the Institute to anyone except the Committee on Arrangements. If it did not, I should like to make a motion that the thanks of the Institute be extended to the President and officers of the Institute for the performance of the work incidental to their respective offices. None except those who have occupied similar positions understand the vast amount of work in the preparation for such a meeting as this. Their success in that work has been so complete and perfect that I move a vote of thanks be extended to the President and his associates. [Seconded by Mr. McDonald.[

The motion as put by Mr. McDonald was carried with a cheer.

The President—Speaking for the President and his fellow officers, I believe they feel they have been amply repaid by the attendance and courtesy shown by the members and by the way they have borne with us when we have run overtime. I thank you, gentlemen. If there is nothing more, the meeting will now take a recess, to finally adjourn at 4 o'clock to-morrow afternoon at the conclusion of the excursion. [Seconded.]

[Abstract Report.—Continued from Page 366.]

SIXTH ANNUAL MEETING, NATIONAL COMMERCIAL GAS ASSOCIATION.

Held at Mechanics' Hall, Boston, Mass., Dec. 6th to 9th, 1910.

Second Day—Afternoon Session.

The President—We will pass on to the next paper by Mr. V. A. Henderson, on

RELATIONS WITH CUSTOMERS.

As a gas company is engaged in the manufacture and sale of gas, the object of its existence is a purely commercial one. Commercialism is, therefore, the dominant factor in the organization and growth of the business, and includes many problems of production, distribution and use of gas. The gas industry was probably late in awakening to the need of adopting commercial methods, but to-day we compare favorably in this respect with other commercial industries, the results that have been accomplished within comparatively a few years being remarkable.

Commercial methods, in short, are simply a study of the requirements of our consumers. Methods are now almost universally adopted in every gas company that tend to educate and at the same time satisfy the consumer. The jokesmith to-day does not secure the smile he formerly did when dealing with the gas company, the gas man and the gas meter. Among our assets to-day are listed the satisfied consumer, and, without hesitancy, we refer new customers to their neighbors and friends.

The establishment of confidence between the consumer and the company is all-important in promoting the gas industry. The consumer should be drilled incessantly in a line of confidential relation with the company, and nothing left undone that will tend to establish the utmost confidence in it. This can best be brought about by a careful study of the requirements of consumers.

A gas company cannot hope for continued success or expect the stamp of approval from the public if the product delivered falls short of the standard that may in justice be expected. We are living in an age too far advanced and are dealing with a public too keen to the rights they are privileged to enjoy for any company to labor under the delusion that they can deliver to their consumers gas inferior in candle power or heating value, without bitter criticism or even penalty.

Good service is a broad term; but I think most of us know what it implies. So I will not dwell long in trying to explain it. But it might be well to offer some of the best means of producing good service, for I believe this good service the first requirement to be considered in dealing with consumers.

Quality of Gas.—This embraces candle power and heat units, both of which should at all times be up to standard.

Distribution.—Uniform pressure and constant supply. Main extensions and services should be laid as soon as a district will warrant the investment, and when the work is done the streets and lawns should be put in the best possible condition.

Prompt execution of orders; and this is applicable to all classes of orders. Prompt service is not only required, but is the treatment that consumers appreciate; and, furthermore, is one that not only stimulates the use of gas, but promotes a friendly feeling toward the company.

Not only is the prompt execution of orders necessary, but the manner in which they are executed is also important. A great deal depends upon the employee doing the work; besides knowing his business, he should be polite, clean, patient and courteous. And, then, the company should do their part by adopting up-to-date methods. The employees should be properly equipped for the execution of all orders. Many companies have adopted the automobile and the motor-cycle; such methods create a very favorable impression upon the consumer, besides being more efficient and less expensive.

Of all the orders the complaint order is the all-important one. Prompt, efficient and courteous execution of the complaint order will accomplish wonders in the standing of any company and will result in a confidential tie between the company and the consumer.

Office in General.—In addition to giving the best service possible, it is very essential that the office of the gas company be conveniently located on one of the principal streets, and no efforts should be spared in making the offices clean and attractive. Public telephones, writing tables and other conveniences should be installed. An information bureau, where consumers and the general public can seek and gain information of a general nature, is also quite important in the modern gas office. The establishment of branch offices in large cities has added considerably to the convenience of the consumers.

Every office should have a doorman whose business it should be to learn the wants and desires of anyone entering the office and place them in charge of a competent clerk or salesman. It is the aim, or should be at least, of every gas company to please and satisfy, and nowhere should a company guard more the treatment of its consumers and be more exacting regarding the courtesies it desires to extend than in its own office.

The personnel of the salesmen and the clerks reflects the policy of the company, and, knowingly or unwillingly, the consumers are either pleased or displeased through the treatment received when they

call to make a purchase, pay a bill or leave a complaint. The office force should be well organized; each department should be versed in the duties of the other.

The application department should use care in taking applications. Signatures should be made legible and care taken in transcribing the proper detailed information to the other department, for all these facilitate the prompt execution of the order and the rendering of a neat and correct bill.

The meter reading department should be drilled constantly, for an error in reading a meter often proves disastrous. The consumer should be taught to read his own meter. He should be taught that the gas meter is not a delusion. Install in the office a glass-inclosed meter and instruct all how it operates and how to read it. Circulars along this line have proven effective.

In the accounting department careful bookkeepers should be employed. A bill rendered to the consumer should be neat and accurate. Uniform statement taking dates should be maintained. Proper care should be exercised to early detect non-registering meters, thus avoiding unpleasant relations caused by rendering estimated bills. Sudden increases or decreases in consumption should be investigated and uniform rates should be maintained. Too much care cannot be exercised in rendering bills, for a customer's confidence is soon lost if he has reason to believe his bill is not accurate.

The consumer should be made to feel that his account is receiving personal attention, not only by the salesman, but by every employee of the company. The employees of a gas company should endeavor to become personally acquainted with all consumers possible, for this will bring the customer and the company closer together—a condition very much desired.

The collection department of any gas office should bear the same relation toward the consumer as does the application, order or accounting departments. Collectors should be instructed on "How to approach a delinquent" in the same way as the salesman is instructed "How to approach a customer." Much business has been lost and many enemies made by a collector's too ready threat of "I'll shut off your gas." Tact, patience, persistence and promptness are necessary attributes in the proper conduct of a collection department.

In every department every employee should be very careful in making promises, and when a promise to do a certain thing on a certain date is made, then that employee should personally see to it that the promise is made good.

Everyone employed in or about a gas office should be polite and courteous. It costs nothing, but accomplishes wonders. The complaint of a consumer should at all times be rigidly investigated and righted in a pleasant and efficient manner that will alleviate all grievances. The nature of the gas business is such that the public, through whom the company exists and its employees are paid, finds it difficult to understand; so it is that, when the public asks questions, a short, inadequate answer cultivates wrath. Completeness of reply is only half of courtesy; the manner of replying is the other half. Every gas office should be so arranged that ample space is provided for display purposes, for these displays not only afford a convenience to the consumer, but serve as an educational feature as well. The window of a gas office should at all times be neatly dressed with the latest appliances.

Commercial Department.—We have now considered almost every department, discussing aome of the most important features in each.

The title of this paper is "Relations with Consumers," and here comes the commercial department, "the one best bet;" for, when it comes to dealing with the consumer, there is not a better or more efficient department connected with a company. For instance, in the commercial department all have, as a rule, well-drilled men, men used to dealing with the public. The department is usually so divided that all have, in addition to the regular solicitors, special men to look after the wants of our consumers, such as service supervisors, whose duty it is to see to it that the consumer is best served in the most efficient and economical way, attending to any and all complaints personally, and here punctuality in appointments plays an important part; but, above all, complete and satisfactory remedy is the one important feature. Then, we have the lady demonstrator, who, in a great many companies, visits the different consumers and offers any aid or instruction in the use of gas that the consumer may require. Again, we have the industrial fuel expert and the illuminating engineer.

The commercial department should be so conducted that it not only becomes one for simply securing new business, but a department to perform all the duties that are embodied in the word "commercialism." In dealing with the subject, there is another phase to be considered, and that is education. The consumer must be educated, not only in the various uses of our commodity, but in the principles and policies of the company in general. This education depends upon the employees; so, first then, the employee must be educated. He must understand the policy of the company as well as the working of his particular department, and this is best accomplished by the management using every effort to instill into the mind of the employee the exact policy of the company and by bringing all departments together at certain stated intervals, and there, through lectures, papers and discussions and informal talks, each individual learns the problems with which the other has to deal. A school of practice, where employees are schooled in every department, each graduating from one department to another, is a valuable means of educating the employees.

The spirit of co-operation must be fathered between the employees and the company. Companies have organized branches of the National Commercial Gas Association, mutual insurance societies, social and athletic clubs, and also some of the large companies have added to their offices cafes for their employees, thus making it possible for all to become better acquainted, besides obtaining a first class luncheon for a nominal sum, all of which prove valuable in instilling the idea in the employee that the company is best that treats its consumers best.

In the education of the consumer, first in importance is the policy of the company, and here the employee is of great assistance, as the company is known through the employee. The consumer must be educated in the various and economical uses of gas, and this can be brought about by advertising in the newspapers, circulars, personal letters, and working demonstration, closely followed by the different representatives of the company. The consumer should be enlightened on the comparative costs of different fuels and lighting systems, and standard up-to-date appliances should be pushed exclusively.

The public policy of a company has its effect upon the consumer. The company should identify itself with every public movement; it should be the "booster" in every city, and should by its activity be recognized as leader in matters which work for public welfare. A sound, honest business policy should be adopted and practiced. A constant effort in promoting the business and eagerness to give perfect service will assure the greatest success and maintain the proper interest between company and consumer.

(To be Continued.)

Electric Competition.

[Prepared for the JOURNAL by MR. W. J. CALLANAN, Seneca Falls, N.Y.]

In these days of strenuous competition, when everybody wants and demands a dollar's worth for a dollar. and "some more," the gas manager's head is awhirl with good service, free maintenance, and many other ideas which are being exchanged by the gas brethren.

Of course, the slogan "good service" is an excellent one, and should be followed out by every company, whether on the gas or the the gas and electric plan. But the maintenance plan can be overdone, with the too frequent cleaning of lamps and burning off mantles in the store of a merchant, where the electric man is conspicuous by his absence.

In the matter of rates the electric companies have the advantage, in that their rates are much more elastic; that is, they can meet a prospect with a flat rate plan, sliding scale, or charge per kilowatt, the hardest to compete with being the flat rate basis of charging.

Some of the competition we have had to meet, such as free wiring and free lamp installation, was not altogether successful, for in the past year we lost just one consumer to the electric.

The best plan to hold the business you have gained, is to have an unobstructed pathway, from consumer to manager; for a talk with "the man higher up" not only gives the consumer confidence, but he further realizes that his business with the company is appreciated and worth making an effort to retain. And it is well to emphasize this fact to the consumer.

The goodwill of the consumer is almost everything, and we lately turned this to good account when we were threatened with gasoline competition. On going to our consumer, who owned the block in which the gasoline system was to be installed, and explaining the case to him, he ordered his tenant to keep it out. In this case, if we had not approached him, gasoline would have entered the field, and in this way we have kept gasoline out entirely.

Look over your consumer's equipment in the summer time. Then is the season to sell him new lamps; for, on a monthly payment plan, by winter he will have an investment in a lighting system that he will hesitate to replace with anything else. If your consumer has a kick, which sometimes happens, be frank with him, get his confidence, and show him how to read the meter. We have a glass meter on the floor, and cards with the printed dial giving instructions how to read it. This dispels the air of mystery which surrounds the meter, and shows that that instrument and meter reading are not "Secrets of the business."

We sometimes write the consumer to witness the testing of the meter, and although the invitation is not often accepted, it nevertheless goes a long way toward removing the barrier which sometimes exists between him and the company.

Some Electrical Work in and about the Gas Plant.

[Communicated by "R."]

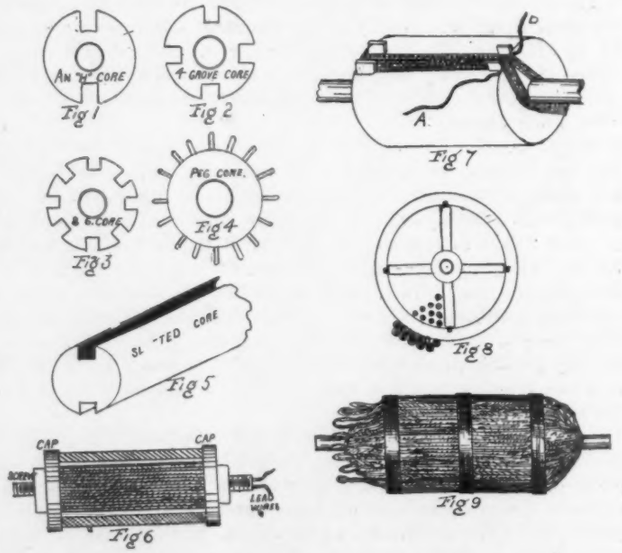
Quite frequently some work of a purely electrical kind comes to hand in a modern gas manufacturing plant, for certain electrical devices are required in connection with up-to-date types of gas engines. Then there are combination electric and gas signs, and we have electrical operating contrivances for extinguishing and igniting gas arcs. Cores of electrical apparatus are to be wound and fitted for use in connection with gas machines, etc. So in this article I will touch in primal way on the method of winding armatures. Passing through a gas manufacturing plant not long since I noted there was an electrical working department in which electrical and gas devices were constructed and assembled, and I also observed that the operations were conducted in sytsematic manner. In certain sections of the storerooms and shops in this plant parts of armatures and electrical contrivances in general were stored for immediate use, and the concern had men in its employ well qualified for their tasks by means of electrical training. In passing it is decidedly reassuring to note how now the kinship between the gas engineer and his electrical coworker work in comparative harmony. Not so long ago the gas engineer and his electrical fellow were anxious to show that one department of lighting and power could compete offensively with the other; but in these days of many improvements, the engineers of both systems often combine in effort to turn out devices that can be counted on to enhance the merit of the work of both.

While many gas mechanics understand the art of winding armatures, others are not familiar with the operation, hence the annexed sketches will assist the student in this field. The armature of the dynamo is the part where the electrical current is generated, as is known, and this current or force may be needed for operation in an ingeniously contrived electrical and gas arc light advertising sign of large size, many of which types are in use on tops of buildings in large cities, with the idea of attracting notice from those far away. In Fig. 1 is shown a simple core of the plainest style of shuttle armature—it is sometimes termed an "H" core. The material is cast iron in most cases, although, where strength is a requisite, wrought iron is employed. It might be necessary to have a 4-groove core, as in Fig. 2, or an 8-groove, as in Fig. 3, or a peg core, as in Fig. 4. When you desire to mount one of these cores it is best to fix it on a shaft through the hole in the center, then you have it securely supported at a point where you can get at it. With file and chipping chisel remove all abrasions and roughness from the grooves, and in fact all parts of the core. The slotted form of core, showing the character of the slot in the length of the same, is shown in Fig. 5. Next comes the work of insulating. Get some manila paper, of ordinary wrapping paper thickness, and shellac this on the core. The work must be done slowly and carefully, and do not cut the paper on the corners of the grooves. The paper should not come with the laps or joints over the grooves, and let each layer dry before you put on the next, otherwise the inner layers will remain spongy. After the layers of paper are on, the wire can be attached a few turns about the shaft, so as to hold it, and the winding may commence.

The beginning-end of the wire may be additionally insulated by winding some of the paper about it. Now proceed to place the wire along the grooves, returning by way of the other groove, and back and forth, and so on. All of the layers should be wound on tightly and hammered as the work proceeds. When the last layers are put on, use the shellac freely; 5 to 10 coats may be employed with good results. The two ends of the wire will, of course, be held on to, and connected with the commutator at the proper time.

Single coil armatures are not used in gas works very much, as these are not very well adapted for motors, owing to the "dead centering" of the same. Therefore, I notice greater uniformity is derived by using more grooves for the wires with an increase proportionately in the segments. In determining the size of the wire, 500-circular mils is usually allowed for every ampere, from 28 to 38 inches in length, for every volt is necessary. In Fig. 6 is shown the plan of one of the partly finished armatures with the manner shown of placing the lead wires. Some of the gas mechanics are constructing armature cores without positive projections between the coils, assuming that such projections are the source of heating excessively, and some of these men are winding on cores in which all projections are disposed of. In other cases pattern pins are employed, the coil being placed in position for the winding of the core accordingly. Fig. 7 is a perspective view of such a core, with fiber pegs employed to keep the winding in position as the winding proceeds, The ends are used for the winding operation back and forth, over the ends of the shafts, through the fiber pegs, and as illustrated, are designated *A* and *B*. Fig. 9 shows a specimen of the entire winding when finished.

The Gramme ring armature are often featured in gas works. The center portion of these rings is simply cut away, leaving the plan, as in Fig. 8. Grooves or seats are cut in the internal circumference of



the rings to allow the spokes or spider to get a grip therein, as shown, and this attaches the exterior core to the shaft of the combination. The process of winding these cores involves some study. The wire goes in and out in the special space allotted for it both inside the coil and outside of it, as demonstrated in the cross-sectional illustration.

There are as many layers inside as outside, and drum armatures are wound without cutting the wire. These ring armatures necessitate the passing of the wire in-and-out through the small side-space in the completion of the coil, although this requires considerable cutting of the wire. However, there are reasons why the ring armature is required by gas men. A drum armature requires that the winding be specially adapted to the number of poles of the field magnets, and as the ring armature can be run in a field of any number of poles, it is consequently seen in use about as often as the drum armature.

Special English Correspondence.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, February 9, 1911.

High Pressure Gas for Industrial Uses at Birmingham.—Publicity.—A Wise Councillor.

The development of high pressure supply proceeds apace. Only a few months since I had occasion to call attention to a very extensive application, mainly for street lighting, but also for private supply in London. Now the Birmingham Corporation have taken a most important step forward, and that of a novel nature, in the establishment of a laboratory and workshop, specially fitted with appliances

for solving problems in connection with the use of gas for industrial purposes. They have at present, at the Winsor street works, two Worthington compressors, each capable of supplying 6,000 cubic feet of gas per hour at 15 pounds pressure, and 7 miles of high pressure mains, extending from the works to Kings Norton (one of the numerous manufacturing districts adjoining Birmingham), half the length being 12-inch diameter. It can also be used, if required, for boosting the ordinary supply. The whole of the mains are of cast iron, and the pressure 7½ to 10 pounds per square inch, with arrangements for reducing where required. The use of high pressure gas is at present confined to this line of pipe. If required in other districts, the use of small compressors is recommended as a temporary expedient, and as soon as a sufficient number are fixed in a street or district, to justify the laying of a high pressure main, they will be taken out, and the supply from the main laid on. The arrangement is a second new departure in the development of high pressure business, and it would seem that Birmingham, already intimately concerned with the early history of gas lighting, is likely to increase its associations with the development of our industry.

The laboratory and workshop just opened comprise a substantial suite of rooms in a prominent central position in the city. There is a large demonstrating room, with office, where working experiments can be conducted upon any kind of technical apparatus, a private laboratory, a store room, and in the basement a thoroughly equipped workshop. The rooms are completely fitted with every necessary accessory, high pressure supply, ventilation arrangements, etc. Although up to the present time the high pressure department has not been advertised, there are already 30 to 40 customers, and the prospect of a large addition to the demand for gas. But the canvassing department will in future be supplied with forms, to be used whenever in the course of their inquiries they come across any business or process to which high pressure gas is applicable. As an example of the work to be done, it may be mentioned that the department was asked to design a furnace that would displace the hand blowpipe method of bronzing. As the result, it was shown that any number of articles up to the full capacity of the furnace could be bronzed in less time than that required to do each article singly by the old process. Makers of special furnaces or burners can also send the same for testing, and the department will be worked on consulting or advisory lines, and in no sense as a competitor with manufacturers of apparatus. The head of the department is Mr. S. W. Smith, already well known in connection with research on gas heating at the Leeds University.

The interest in the new scheme will extend far beyond Birmingham. The industry at large will watch the results, and there is every probability that the plan will be followed in other important centers. Some time ago we were told that gas had passed its zenith, and rapidly travelling to the region occupied by displaced and obsolete devices. But it is evident that there are yet unexplored possibilities. The Birmingham undertaking, at any rate, does not exhibit the usual features of a decaying business.

There is another aspect of this question. Considerable interest is centered just now on the question of publicity, and a special committee of the Institution of Gas Engineers has the matter in hand and is endeavoring to secure the co-operation of every gas undertaking throughout the country. Much interest is excited as to the lines of advertising that they may take up. But the Birmingham departure reminds one that there are forms of advertising that are not set forth in displayed type or printer's ink. We are saturated up to the ears with advertisements nowadays. Everybody advertises and everybody believes that business cannot be done without advertising. So not only the greater part of our newspapers and periodicals are devoted to advertisements, but every vacant spot in our streets is covered with posters, while the railway stations and other public places are so thickly strewn with advertisements that often one cannot see whether the walls are brick or stone. Writers of modern advertisements evidently believe in Carlyle's classification of "mostly fools," for the majority of the pronouncements do not appeal to a high order of intellect, while many are obviously silly or vulgar. And this also applies to the leaflets or pamphlets that are intended for delivery from door to door, either by post or by hand. Some advertisements —one does not like to give specimens—aim at catching the eye of the public by such meretricious methods as absurd or exaggerated catchy phrases that are not intended to be taken literally. The developments in photography and color printing enable a great deal to be done in the way of pictures. Many of these efforts are of a really tasteful and pleasing character. Others are so objectionable as to suggest the need for all posters to be exhibited in public places to be under some sort of control. So the Publicity Committee has much material available, and it is to be hoped that they will not forget to uphold their own dignity and that of the important industry that they represent.

It is a common reflection upon managers of gas works that they are slow and sleepy in the matter of new business, and especially that they do not advertise. But is the business capability of a concern to be judged by the number of leaflets or pamphlets distributed, or by the extent of space occupied on the boarding or on the front page of a newspaper? Which is likely to be the best, the most far reaching and enduring advertisement, a leaflet brilliant with color and sparkling with smart epigram, or a furnace (see previous paragraph) that shows a marked advance as regards efficiency and economy over previous methods? Some of those who are open to the charge of not supporting direct advertisements have built up a good business on the lines, not of no advertisement at all, but of such indirect advertisements as repeated reductions in price, prompt attention to orders and complaints and an efficient system of supply. These must always occupy the front or primary position. If they are neglected in favor of printer's ink the business loses its honorable and dignified character.

The Publicity Committee have addressed an appeal to the Chairman of Gas Companies and Committees, and there are rumors to the effect that the result is somewhat disappointing. I can well understand that many gas undertakings do not at present see the necessity or feel the need for an advertising campaign in their district, or realize how their excellent and well established connection, developed on the indirect lines above suggested, is to be helped or improved thereby. The season of the year is not opportune for appeals of this character, as many are now occupied with questions relating to the half yearly or annual reports and accounts. The time for these special matters is after the shareholders' meeting has been held and the dividend declared. Many chairmen are busily engaged in other branches of industry and do not pretend to keep in touch with the general progress of gas matters outside their particular concern, but look to the engineer for information as to any topic of the day. The appeal would have had a better effect if some endeavor had been made to secure the sympathy and support of the members, who would scarcely be in a position to do justice to the subject. It has even been suggested that some engineers are not supporting the movement on account of personal feeling, and while I do not think there is much in that, I can quite understand that the appeal may have been lost sight of amongst the numerous leaflets and pamphlets that are addressed to "the Chairman," or that may have been hurriedly disposed of, to make way for other matters, without the engineer or manager having opportunity to say a word in its behalf.

At a meeting held in Glasgow under the auspices of the Smoke Abatement League, a lecture was delivered by Mr. Peter Fyfe, the chief sanitary inspector for the city, on the pollution of the air, its causes, effects and cure. The subject matter of the lecture, though interesting from a general point of view, has no special bearing on our industry. But the Chairman of the meeting, Dr. Robert Crawford, in introducing the lecturer, made some very pertinent remarks as to the responsibilities of the Gas Committee of the Corporation, as controllers of the gas supply, and the ways in which they might assist the movement. Unlike many who address the public on this point, he was competent to take a comprehensive all-round view of the question, and addressed himself to it in a broad-minded spirit that considered the rights of all concerned. After enlarging on the necessity for mininizing and doing a way with fog, he went on to refer to the importance of cheap gas. The Glasgow Corporation price was 2s. 6d., but at Coatbridge a private Company was supplying at 1s. 7d. The illuminating power of the gas had been reduced—he remembered demonstrating to other members of the Corporation, that in practice a better light could be and was obtained from 20 than from 25-candle gas—and the average was over 17 candles. But with the introduction of the incandescent burner new conditions obtained, and there was no reason why the illuminating power should not be reduced even to 10 candles, in which case it could be sold at 1s. 6d. or 1s. 4d. per 1,000 cubic feet. In this way the use of gas could be encouraged, which was one of the special ways in which fog could be reduced. It was not enough to encourage the use of gas for lighting, but the gas department must take a larger view of the development of the use of gas for cooking, heating and technical purposes, and regard the supply of appliances as something more than mere profit making. The use of gas was not pushed in Glasgow in the way a private com-

pany would push it. They would canvass, advertise, even freely give away small and cheap appliances, and create a large demand, a big profit, and at the same time help the solution of the problem that they were to consider that evening.

All progressive gas companies are as one with Dr. Crawford in using every endeavor to increase the use of gas. They are actuated perhaps by different considerations. Dr. Crawford wants to see a purer and a clearer atmosphere. They want not only to increase the profits, but to improve the stability of their position. The same goal is reached by different roads. Also, it is interesting to find the member of a corporation in agreement with the view that has always been held in this column. Dr. Crawford asserts that a private company would sell gas cheaper than the corporation, and the view I have taken is that on the whole the consumer is better off under a private company than he is with the municipal authority.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 10 cents.

982,790. Inverted Incandescent Mantle Lamp. R. E. Bruckner, Mount Vernon, N. Y.
982,808. Controller for Gas Burners. A. Girtanner, St. Louis, Mo.
982,861. Device for Opening and Closing Gas Taps from a Distance. B. C. H. Pegler, Kingston-on-Thames, England.
982,879. Gas Heater. J. Rubado, Chicago, Ills.
982,958. Inverted Incandescent Mantle. C. K. Harding, Chicago, Ills.
982,983. Gas Burner for Coke Ovens. R. Muller, Essen-on-the-Ruhr, Germany.
983,199. Catalytic Synthesis of Methane. F. Bedford and C. E. Williams, Sleaford, England, assignors to Cedford Gas Process Company, London, England.
983,336. Incandescent lamp. T. White, Brooklyn, N. Y.
983,413. Heat Concentrating Ring for Gas or Vapor Stoves or Ranges. L. W. Swafford, Vicksburg, Miss.
983,967. Automatic Gas Cut-Off. C. A. Woods, Plankinton, S. D.
984,047. Apparatus for Determining Dust and Moisture in Gases. L. A. Touzlin, Chicago, Ills.
984,177. Incandescent Gas Burner. L. T. Alton, Brooklyn, N. Y.
984,165. Gas Burner. H. J. Solliday, Oklahoma, Okla., assignor of one-half to D. F. Solliday, same place.
984,221. Production of Gases of High Oxidizing Efficiency. C. Hornbostel, New York City.
984,268. Detachable Seamless Diaphragm for Gas Meters. H. F. Frick, Jersey City, N. J.
984,314. Gas Stove. C. B. Stillwell, Wayne, Pa.
984,315. Gas Igniter. C. B. Stillwell, Wayne, Pa.
984,447. Apparatus for the Production of Water Gas. H. E. Smith, Westminster, England.

PUBLIC LIGHTING TABLE FOR MARCH, 1911.

[COMMUNICATED BY THE AMERICAN METER COMPANY.]

Day of Week.	MOONLIGHT SCHEDULE.		
	Date.	Light.	Extinguish.
Wednesday	1	6.20 P.M.	5.30 A.M.
Thursday	2	6.20	5.30
Friday	3	6.20	5.30
Saturday	4	6.20	5.30
Sunday	5	10.30	5.20
Monday	6	11.40	5.20
Tuesday	7	1.00 A.M. F.Q.	5.20
Wednesday	8	2.00	5.20
Thursday	9	3.00	5.20
Friday	10	3.50	5.20
Saturday	11	4.30	5.20
Sunday	12	5.00	5.20
Monday	13	No L.	No L.
Tuesday	14	No L. F.M.	No L.
Wednesday	15	No L.	No L.
Thursday	16	6.40 P.M.	9.00 P.M.
Friday	17	6.40	10.00
Saturday	18	6.40	11.10
Sunday	19	6.40	12.10 A.M.
Monday	20	6.40	1.10
Tuesday	21	6.40	2.10
Wednesday	22	6.40 L.Q.	3.00
Thursday	23	6.40	3.50
Friday	24	6.40	4.40
Saturday	25	6.40	5.00
Sunday	26	6.50	4.50
Monday	27	6.50	4.50
Tuesday	28	6.50	4.50
Wednesday	29	6.50	4.50
Thursday	30	6.50 N.M.	4.50
Friday	31	6.50	4.50

Items of Interest
FROM VARIOUS LOCALITIES.

MR. F. E. BARBOUR, Assistant to the President of the Portland (Ore.) Railway, Light and Power Company, will retire from that post the 1st prox., to take over the duties of Assistant to the President, Pacific Gas and Electric Company. His headquarters will be in San Francisco.

DR. E. D. LEIDY, for several years President of the Flemington (N. J.) Gas Company, died at his home in that city the morning of the 19th inst. He was in his 59th year, and had been a practising physician for many years in the section noted. He was a man of letters, held high rank in his profession, and also took quite a part in the business affairs in and around Flemington.

THE main thing in interest at the hearing before the up-State section of the New York Public Service Commission, sitting in Buffalo, the second week of the current month, on the application of the Buffalo Gas Company to fix the rate at which it might sell gas furnished for illuminating use – this is the first petition of that nature that the Commission has been called upon to consider. The Company claims that the lowest possible living rate is 95 cents per 1,000 cubic feet, and the city alleges that such a figure is "grossly excessive," and in support of its contention has been tendering the Company 70 cents per 1,000, in fact, the tender at the named low figure is based on a decision of the lower Court. At the initial hearing Corporation Counsel Hammond and Counsellor William B. Trye represented the city, and the Company's argument was in charge of Mr. Louis L. Babcock, of the firm of Rogers, Locke & Babcock. Commissioner Stevens, having called the case, suggested that, as a fair basis of procedure, the following terms should be agreed upon, and both parties to the position consented. It was decided that the Company should make inventory and appraisal of all its property as of date of January 1, 1911, including schedules of operating expenses since 1906, and of all properties, including real estate, upon which it claims it is entitled to a return, and file a copy of the same with the commission not later than March 1st. The city then is to have the privilege of going over the schedules of the Company with its experts, and also to inspect the plant and get up a statement showing the value which it attaches to the gas property, its schedules to be filed by March 20th. The hearing was then adjourned until March 24th, when arrangements will be made for further procedure.

AT the special meeting of the shareholders of the Baltimore (Md.) Consolidated Gas, Electric Light and Power Company, held the 17th inst., it was determined to hold on the 1st prox., a vote to determine whether or not additional common stock, in the sum of $1,500,000, should be issued.

AT the annual meeting of the Peekskill (N. Y.) Lighting Company the Directors elected were: William Rockefeller, G. B. Cortelyou, W. R. Vanderlip, F. L. Lambrecht and C. M. Carbonell.

THE Malden and Melrose (Mass.) Gas Company has withdrawn its refusal to supply gas to Mr. James E. Finneran of Everett, Mass., occasioned by his declining to refund a sum of $4.25 that had been stolen from a prepayment meter on his premises. Thus ends a very peculiar case, which seems to have been brought about mainly through an exhibition of "excessive executive ability" on the part of a member of the commercial engineering division.

THE New York Public Service Commission, Second District, has recommended the granting of the application of the North Shore Electric Light and Power Company, of Port Jefferson, Long Island, for the right to generate and distribute electric currents in the towns of Brookhaven and Smithtown. This decision is an important one, in view of the fact that the company had once before to obtain the desired permission. Last June the original application was entered, but a negative reply was made to the application on the ground of certain pledges made by the Port Jefferson Electric Light Company that it would so improve its plant and facilities as to blot out all cause for future complaint. The testimony taken at this hearing, however, showed that no section of the pledges had been honored, wherefore the change from dissent to assent.

THE Cruse-Kemper Company has been awarded the contract for building a storage holder on the new works of the Poughkeepsie

(N.Y.) Gas Light Company. It is up to retaining 100,000 cubic feet and will be erected forthwith.

THE Sodus (N. Y.) Gas and Electric Company has selected the following officers for the ensuing year: President, C. Warner Mills; Vice-President, T. H. Munro; Secretary, G. Ray Mills; Treasurer, E. A. Larkin.

"Let me say through the old JOURNAL that the Flatbush (N.Y.) Gas Company's Employees Association had a splendid time last Wednesday evening, on which night they enjoyed themselves in hearty fashion. The occasion was the Fourth Annual Ball of the Association, and the place of merrymaking was in the New Park Circle Casino, Coney Island. To be sure when the leader measured the time of the Blue Danube waltz (or something like it) one could not help comparing the difference in sound volume between the poundings of old ocean on Coney's sands and the rippling of the Danube on its golden footway, but our folks paid little heed to these disturbances. In fact, it was the Blue Danube *a la* Isle de Coney; that was all. None of them knew the difference. However, the proceedings were of the liveliest order, good fellowship prevailed and harmony ruled. A right good supper took nothing from the features of the affair and Sergeant 'Tommy' Smith didn't have a thing to do but dance and eat. The officers of the Association are: President, J. T. Heffernan; Vice-President, Jerome Farrell: Secretaries, F. A. Murphy and C. G. Sabin; Treasurer, L. O. Trobell.—PAARDEGAT.

THE authorities of Moss Point, Miss., have authorized Mr. F. L. Brown and associates, of Chicago, to construct and operate a gas works at the named point.

THE Columbus (O.) Gas and Fuel Company has made its peace with the authorities by paying over to them the sum of $34,091.08 on franchise royalties account. This claim has been in contention for over 7 years, and the sum named includes about $6,000 interest charges.

AT the annual meeting of the Easton (Pa.) Gas Company the officers chosen were: Directors, U. H. McCarter, S. L. Shober, Jr., H. E. Mitchell, J. M. Porter, H. H. Scott, A. M. Whitney, T. W. Cramp, B. F. Cresson, S. C. Smith, E. J. Fox, C. Snyder, A. D. Chidsey, W. J. Daub and F. S. Bixler. The new man on the Board is Mr. H. H. Scott, who replaces Mr. F. E. Drake. The Directors named the following officers: President and Treasurer, B. F. Cresson: Secretary, T. F. McPherson; First Vice-President, H. H. Scott; Second Vice-President, S. L. Shover, Jr. A scanning of this list cannot fail to impress upon the thought of the scanner that the Easton Company surely has a staff of executives well up in numbers.

THE project for a gas plant at Grants' Pass, Ore., has again been actively taken up, the prime movers being Mr. A. W. Butler, of Minneapolis, Minn., and Messrs. P. B. Herman and E. L. Churchill, of Grants' Pass. The terms of the franchise provide that the life of the franchise is to be 50 years; that the grantees shall eventually construct a plant up to the gaseous needs of a population of 30,000; that construction work shall be commenced within 90 days, and the plant completed within 8 months from the signing of the agreement; that the Company shall bear all expense for service piping and connections; that the city shall have the right to purchase the plant at the termination of the first 21 years of its use, the price to be based on the physical valuation of the plant at the time, as determined by assessors especially appointed for the purpose.

THE net earnings of the New York and Richmond Gas Company, of Staten Island, N. Y., for the 12 months ended December 31st, from operation (amortization charges having been allowed for) amounted to $54,921.

"V. O. T.," writing from Lynn, Mass., under date of the 17th inst, says: "I thought you might be interested in learning something about the history for the year of the Employees' Benefit Association of the Lynn Gas and Electric Company, which was held some evenings ago in the quarters of the Lynn Historical Society. A good attendance was present, and all were thoroughly satisfied at the showing made, the expenses being less than the receipts in the sum of $70.50. Which showing is really better than the bare figures show, for 2 death benefits were met and 23 sick benefits paid out. The Association (it was organized November 23, 1909) was incorporated February 1, 1910, and its charter was bestowed March 5, 1910. The members agreed that the rolls would have to carry 200 names a twelvemonth from now. The officers elected were: President, Wm. H. Kirk; Vice-President, F. J. Dubois; Clerk, D. J. Kerlihy; Treasurer, R. E. Roberts.

THE property, rights and franchises of the Union Gas Light and Fuel Company, of Anderson, Ind., were offered at auction, by the Receiver, Mr. J. E. May, the morning of the 10th inst., the offering being made in the Company's office. It was thought that there would be spirited bidding, but the matter was easily disposed of, the property being knocked down to Mr. C. W. Hooven at his bid of $200,000. That sum will about give to the bondholders 35 cents on the dollar.

IT looks that the Brainerd (Minn.) authorities will consent to the petition of Arthur M. Smith for the right to construct and operate a gas plant in the named place. He has a clever adviser in the person of Mr. C. C. Sloan, of the Crookston (Minn.) Company.

DURING the 12 months of 1910 the St. Paul (Minn.) Gas Light Company earned $1,721,654.98, of which gas was responsible for $1,025,079.01, and electricity $652,933.44. Of the balance, the sum of $27,025.15 came from the sale of residuals. The expenditures of the Company on all accounts amounted to $1,537,288.82, and in the listings of expense a notable item is a charge on royalty account amounting to $86,033. Pretty good citizen, it would seem. The Company's army of employees numbered 461, who received a total of $268,230.24 for their services. The consumers on gas account numbered 4,884, and the net rate for gas is $1 per 1,000. The electric current charges range between 13½ cents, and 5½ cents per kilowatt hour. During the year, charges to construction account were: Gas division, $145,242.86; electric, $140,895.64.

THE gas rate at Lock Haven, Pa., since the 1st inst., rules at $1 50 gross, $1.25 net; the electric rates are: Maximum, 7 cents; minimum, 6 cents. The concessions were made altogether voluntarily.

THE Atlantic City (N. J.) Company since the first of the year, has been operating a laboratory, in the details of which the best modern practice was followed. It is in charge (under the direction of Mr. Carlton Geist, General Superintendent of the Company, of course) of Mr. William A. Dunkley, Post Graduate, University of Michigan.

THE Vancouver Gas Company will erect a distributing holder for the better supply of its Grand View (British Columbia) section.

THE Worcester (Mass.) Gas Light Company will construct a new house for its condensing and scrubbing plant on its Quinsigamond avenue site.

AT a meeting of Directors of the several subsidiary Companies controlled by the Columbia (Pa.) Power, Light and Railways Company, which was held some time ago in Bloomsburg, Pa., steps were taken to complete the merging for joint operation of all the gas and electric lighting Companies from Shickshinny, Pa., to Danville, Pa., and kindred railroads of the trolley type. The concerns number 22, and all these will hereafter be under control of and will be operated by the Columbia Gas and Electric Company. The Directors for the first year are, Messrs. E. R. Sponster, Myron I. Low, C. M. Creveling, W. F. Lowry and A. W. Duy. Meetings of the various shareholders in the separate Companies were called for Friday last, and while we have not heard definitely the result there is no cause whatever for any idea that the agreements for consolidation and merging them submitted would not be ratified.

SOME time ago Mr. C. W. Bennett, General Manager of the Binghamton (N. Y.) Gas Works, received from Mr. Chas. H. B. Chapin, Secretary of the Empire State Gas and Electric Association, the following letter:

"On behalf of the Association, and in accordance with the vote at the meeting on Wednesday, February 1, I wish to convey to you personally and to your Company the thanks of the Association for the courtesies which you extended in connection with this meeting. I also wish to express through you, to the 'Mercantile-Press' Club, of Binghamton, the thanks of the Association for their courtesy in allowing us the use of the room for the meeting and the use of the dining room for luncheon. It was greatly appreciated by the members."

THE AMERICAN GAS LIGHT JOURNAL

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AGENTS:

New York—American News Company, 11 Park Place.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime street, London.

MONDAY, FEBRUARY 27, 1911.

The Market for Gas Securities.

About 2 points off may be recorded in Consolidated quotations for the week. The opening to-day (Friday) came in at 138½ to 139, and there is no other reason to offer for the break than the slump in the general market caused by the decision of the U. S. Supreme Court in the railroad rate cases.

The tendency in out-of town shares is rather in favor of higher prices. Even Peoples, of Chicago, despite the rabid, uncivil political campaign now underway there, stands up fairly well. Washington (D. C.) is 400 to 405—it should be 500, or over. The Massachusetts Gas Companies shares are bound to cross par before Easter day.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

FEBRUARY 27.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$78,177,000	100	138⅛	139
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	102	103
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	3,500,000	100	155	165
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101¼
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	100	102
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	139	139½
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	200,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	5/8	¾
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed				
Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric				
Co.	29,500,000	100	92	93
Columbus (O.) Gas Co., 1st				
Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. &				
Heating Co.	1,682,750	100	90½	91
Preferred	3,026,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	106½	—
Mortgages, 6's	3,600,000	-	89	100
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	3,500,000	—	102	105
Detroit City Gas Co.	6,580,000	—	—	50
" Prior Lien 5's	5,619,000	1,000	97	100¼
Detroit Gas Co., 5's	381,000	1,000	75	80
Equitable Gas & Fuel Co.,				
Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co.,				
1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of				
New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	108	108¼
Indianapolis	2,000,000	—	78	83
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co.,				
of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis	10,000,000	100	111¾	112
Preferred	2,500,006	100	94¼	102
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	106¾
Massachusetts Gas Companies, of Boston	25,000,000	100	93	93¼
Preferred	25,000,000	100	96	96⅛
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co.,				
Chicago	25,000,000	100	105	105¼
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	--
Consolidated 5's	2,000,000	—	104¾	105¼
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	100	102
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	3,447,000	1,000	90	95
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	100	104
Washington (D. C.) Gas Co.	1,600,000	200	399	400
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	361	—

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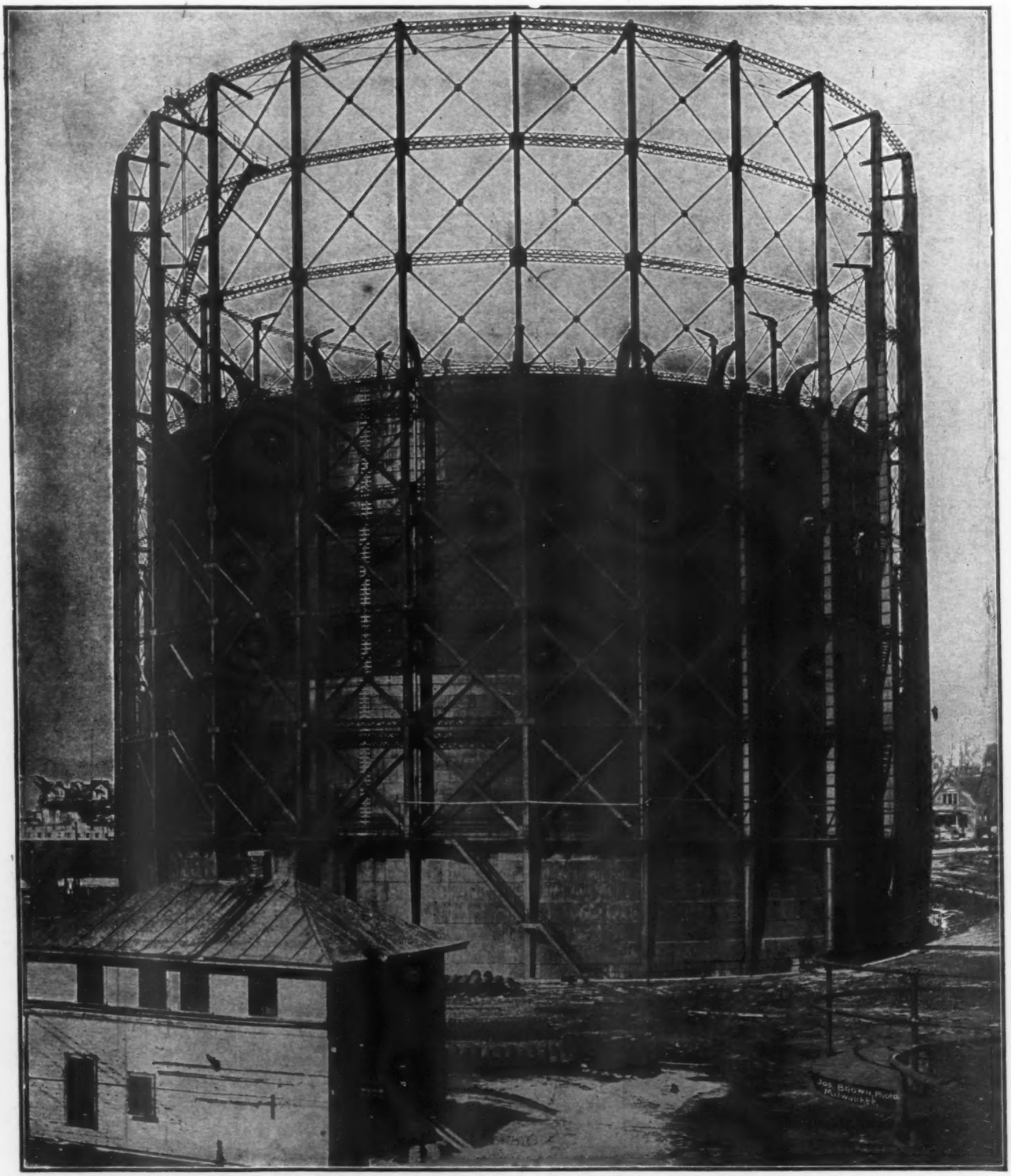

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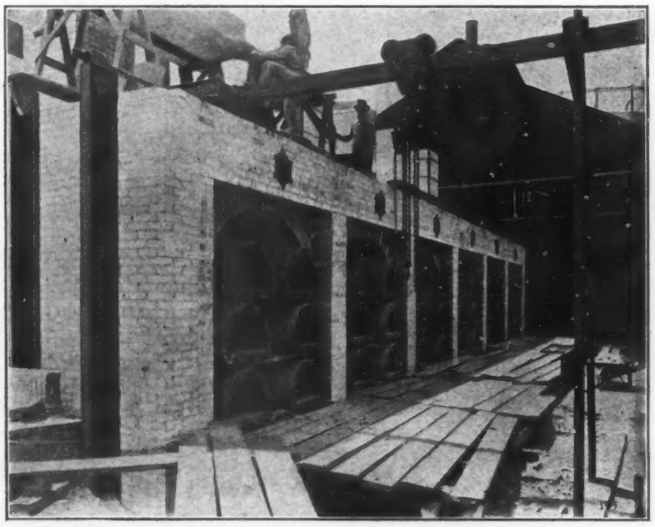

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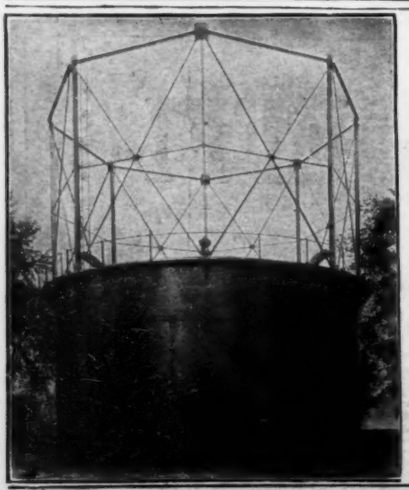

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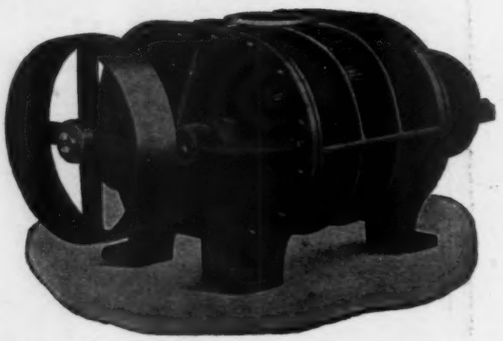

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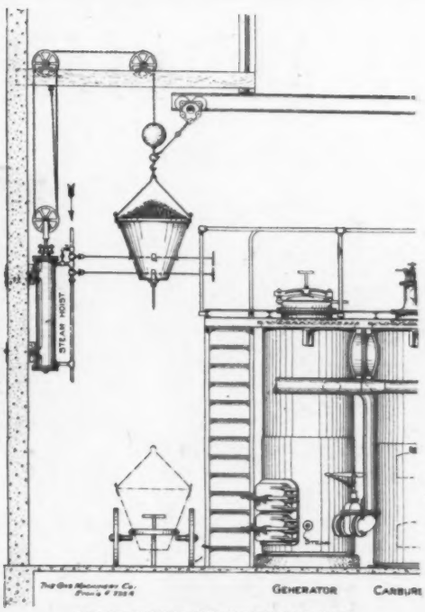

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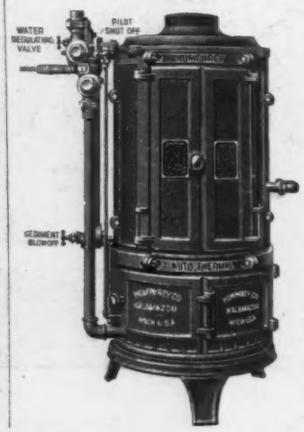

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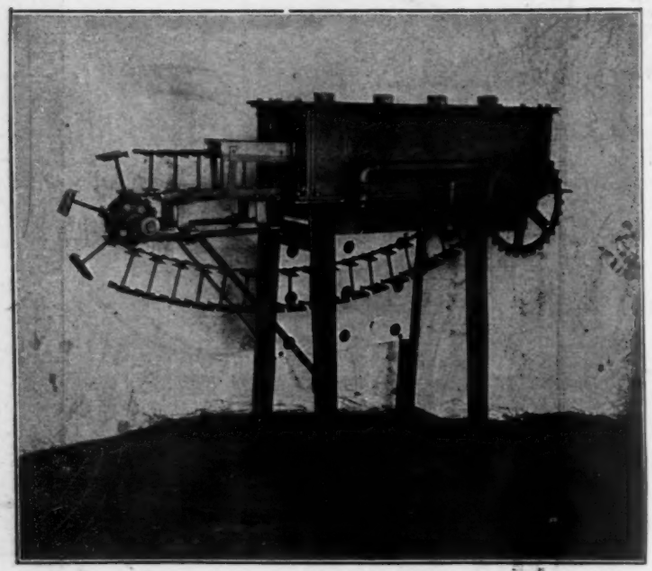

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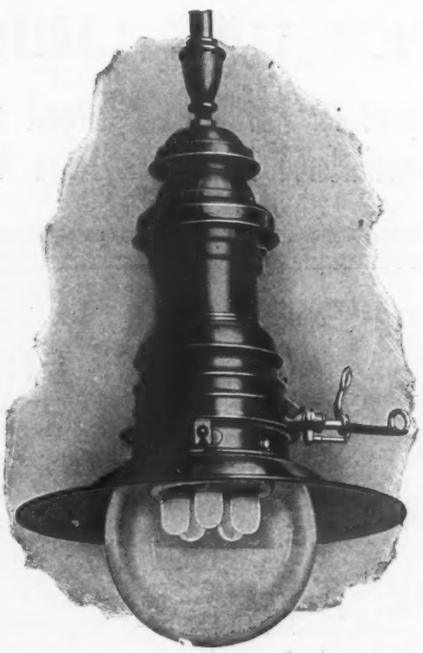

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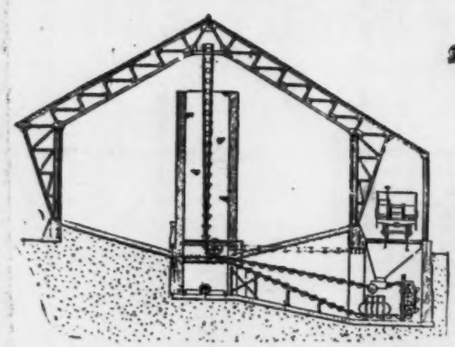

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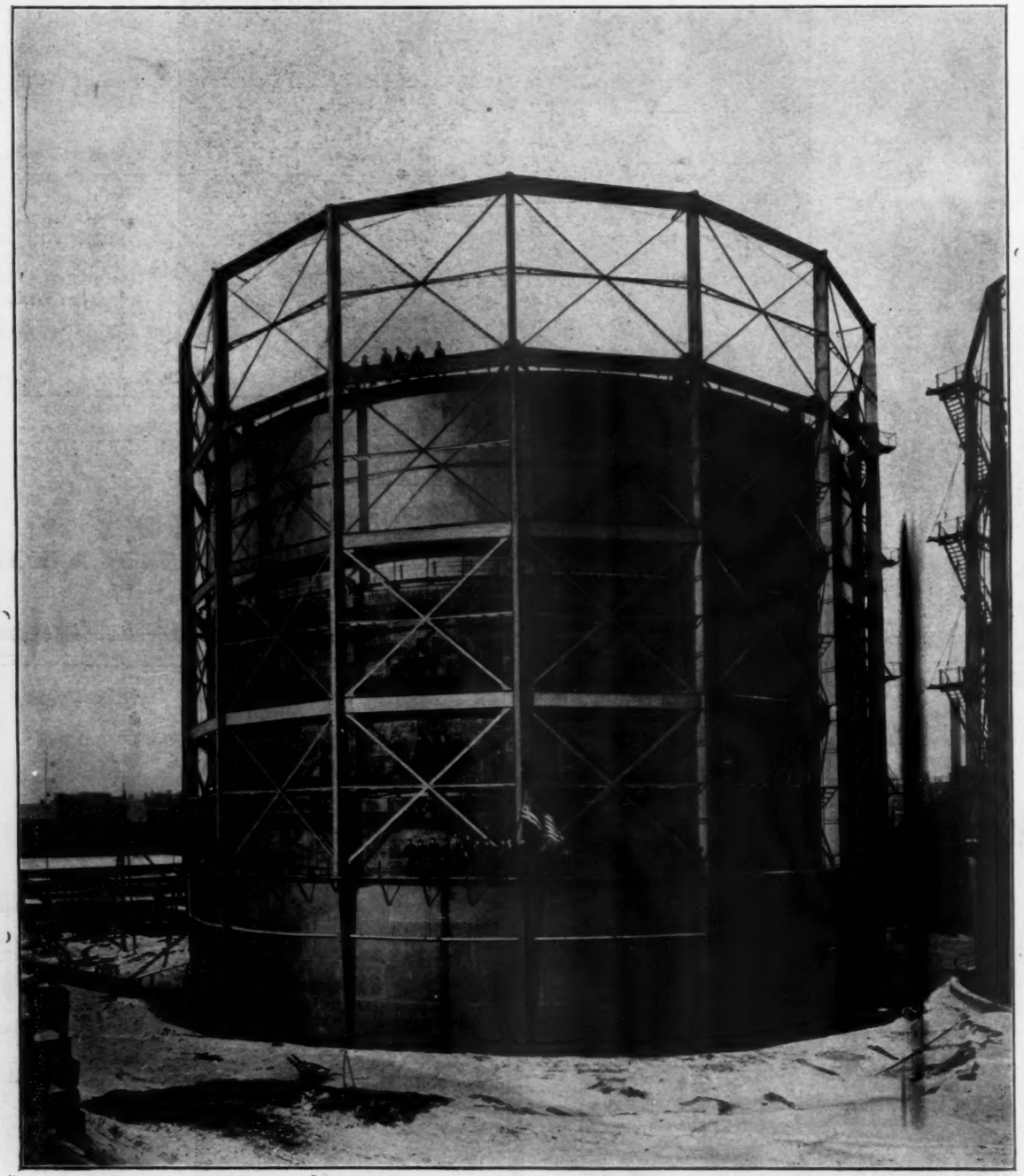

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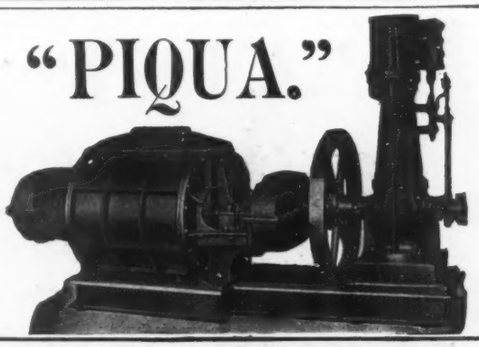

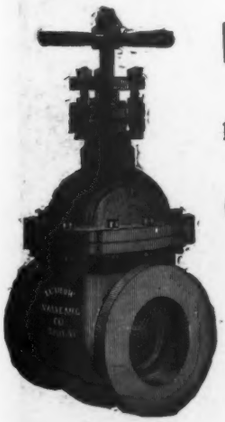

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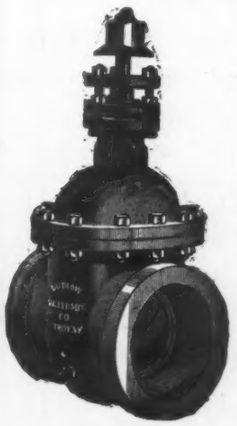

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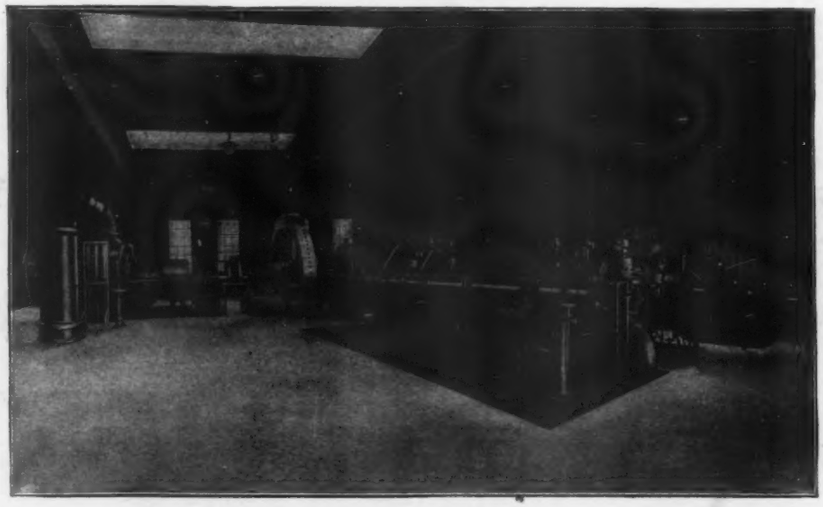

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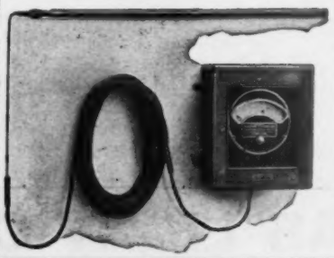

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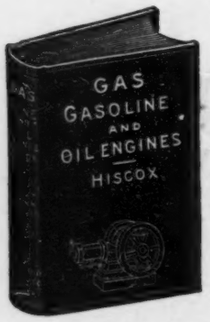

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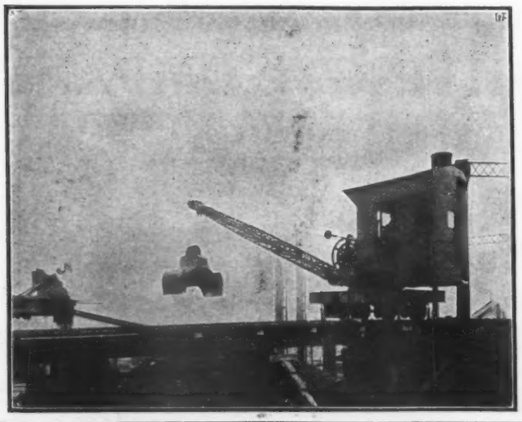

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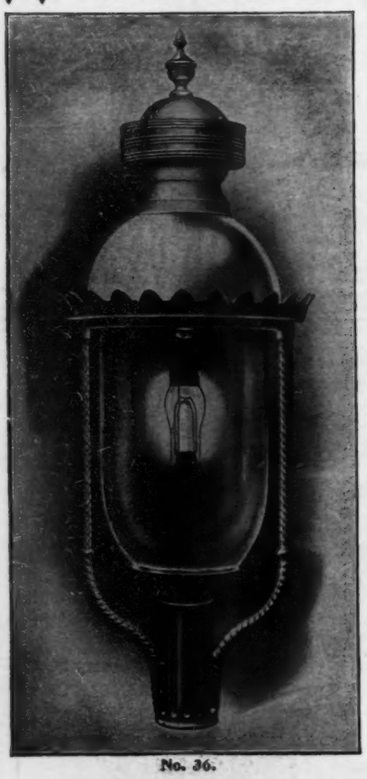

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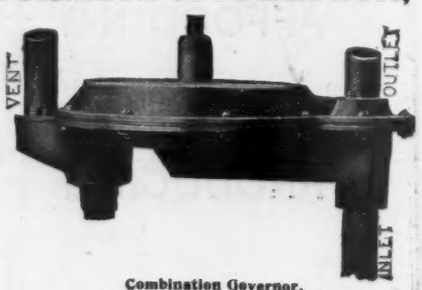

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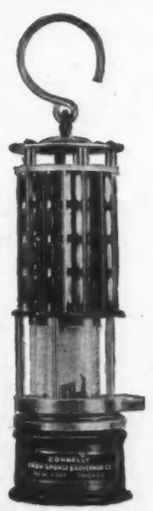

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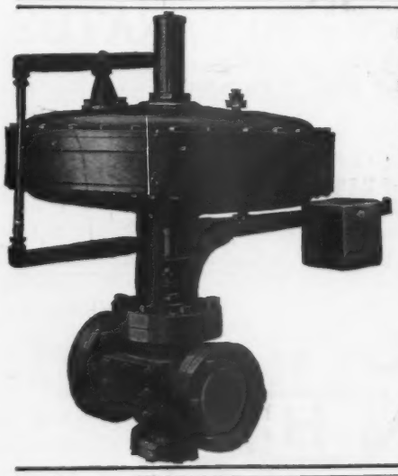

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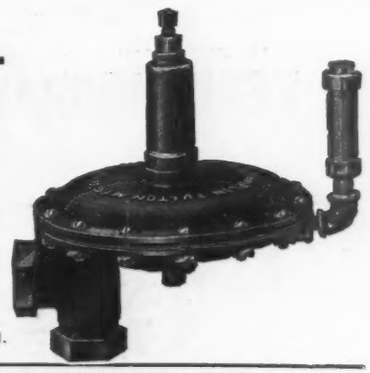

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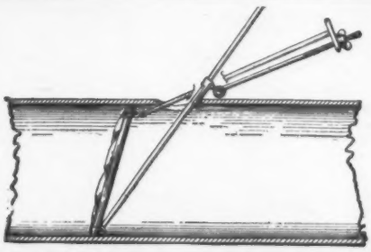

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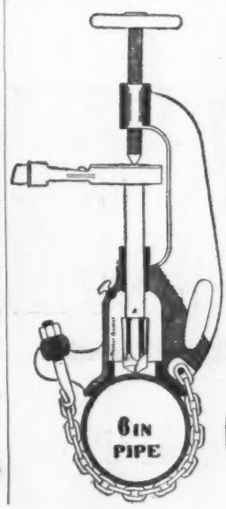

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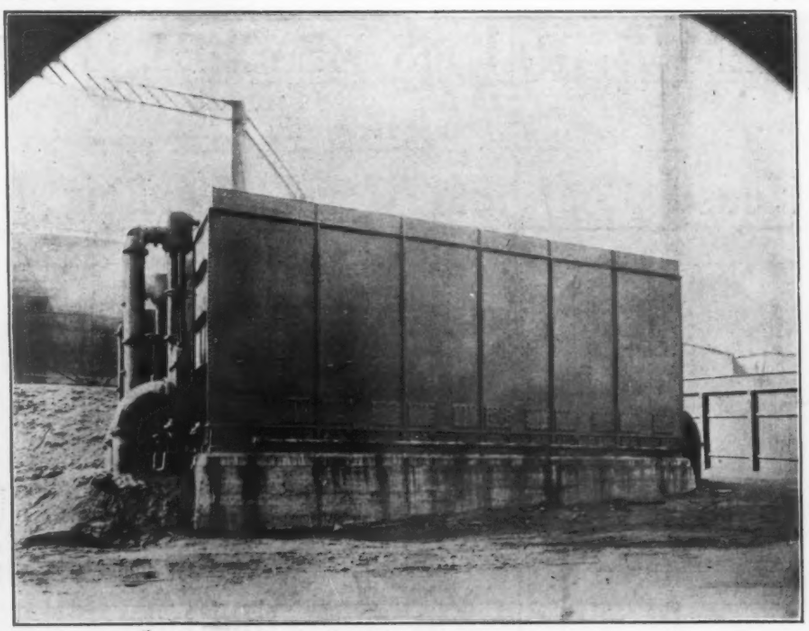

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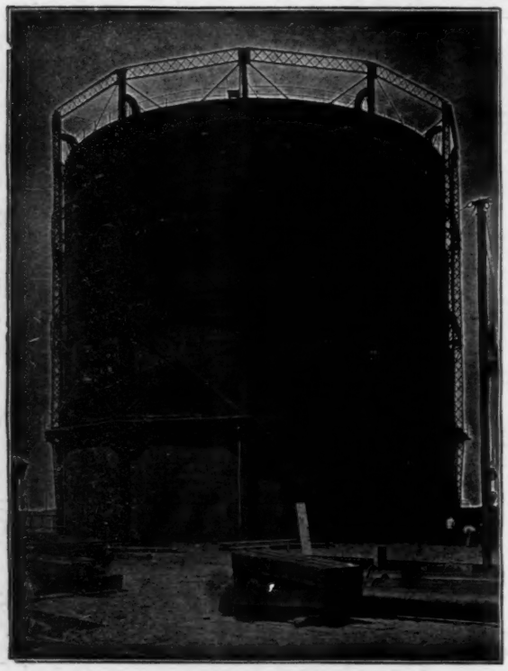

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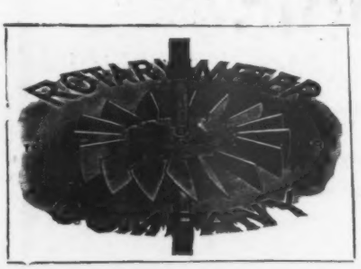

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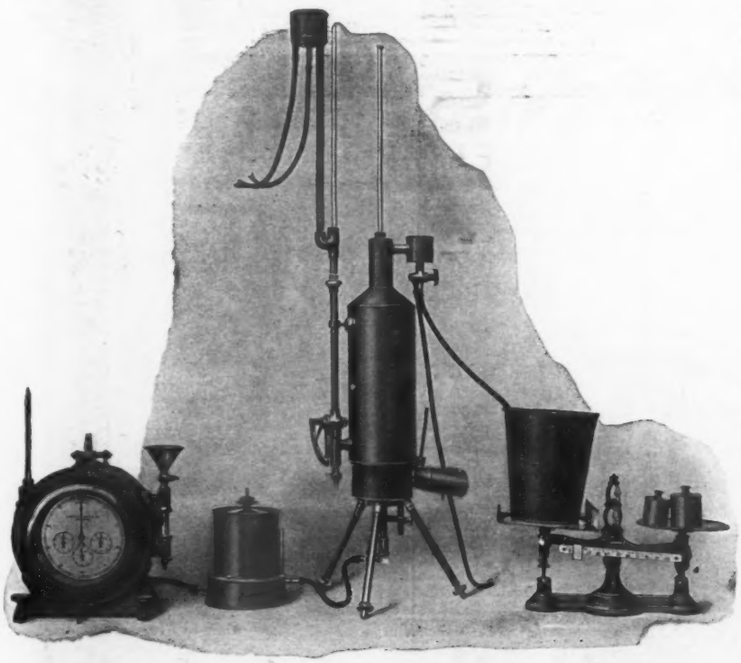

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